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QUICKIN

Generation and manipulation of grid-related parameters such as bathymetry, initial conditions and roughness

User Manual

Hydro-Morphodynamics & Water Quality

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1 Guide to this manual

1.1 Introduction

This User Manual concerns the data interpolation module, QUICKIN, of the Delft3D software suite. To make this manual more accessible we will briefly describe the contents of each chapter and appendix.

If this is your first time to start working with QUICKIN module we suggest you to read and practice the getting started of Chapter 3 and the tutorial of Chapter 6. These chapters explain the user interface options and guide you through the definition of your first data interpolation to a curvilinear grid.

Chapter 2: Introduction to QUICKIN, provides specifications of QUICKIN and the areas of applications.

Chapter 3: Getting started, explains the use of the overall menu program, which gives access to all Delft3D modules and to the pre- and post-processing tools. Last but not least you will get a first introduction into the QUICKIN Graphical User Interface, used to define data on of grids vertices or grid cells which can be used in a hydrodynamic, wave or water quality simulation.

Chapter 4: General operation, provides practical information on the general operation of the QUICKIN module.

Chapter 5: Menu options, provides a description of all menu and toolbar options.

Chapter 6: Tutorial, emphasis at giving you some first hands-on experience in using the QUICKIN module to define the input of a simple problem.

References, provides a list of publications and related material on the QUICKIN module.

Appendix A: Files of QUICKIN, gives a description of the files that can be used in QUICKIN as input or output. Generally, these files are generated by QUICKIN or other modules of the Delft3D suite and you need not to be concerned about their internal details. However, in certain cases it can be useful to know these details, for instance to generate them by means of other utility programs.

1.2 Name and specifications of the program

Title	QUICKIN
Description	QUICKIN is a program for the generation, interpolation or manipulation of space varying quantities such as bathymetries, initial conditions or parameter fields on Cartesian or spherical (curvilinear) grids e.g. created with RGFGRID (RGFGRID (2013)). Bathymetries can be generated for both the hydrodynamic simulation programs Delft3D-FLOW (Delft3D-FLOW (2013)) and Delft1D2D (Delft1D2D (2002)), QUICKIN can display animations of flooding files generated with Delft1D2D.
Special facilities	various interpolation methods user selectable 'area of influence' by polygon various viewing options various depth manipulation options

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various sample manipulation options
functionality: dredge and dump areas
new functionality: multiple grids and depths

1.3 Manual version and revisions

A manual applies to a certain release of the related numerical program. This manual applies to QUICKIN, version 4.17.00.

1.4 Typographical conventions

Throughout this manual, the following conventions help you to distinguish between different elements of text to help you learn about QUICKIN.

Example	Description
Waves **Boundaries**	Title of a window or sub-window. Sub-windows are displayed in the **Module** window and cannot be moved. Windows can be moved independently from the **Module** window, such as the **Visualisation Area** window.
Save	Item from a menu, title of a push button or the name of a user interface input field. Upon selecting this item (click or in some cases double click with the left mouse button on it) a related action will be executed; in most cases it will result in displaying some other (sub-)window. In case of an input field you are supposed to enter input data of the required format and in the required domain.
<\tutorial\wave\swan-curvi> <siu.mdw>	Directory names, filenames, and path names are expressed between angle brackets, <>. For the Linux and UNIX environment a forward slash (/) is used instead of the backward slash (\) for PCs.
“27 08 1999”	Data to be typed by you into the input fields are displayed between double quotes. Selections of menu items, option boxes etc. are described as such: for instance ‘select *Save* and go to the next window’.
`delft3d-menu`	Commands to be typed by you are given in the font Courier New, 10 points.
	User actions are indicated with this arrow.
[m/s] [-]	Units are given between square brackets when used next to the formulae. Leaving them out might result in misinterpretation.

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1.5 Changes with respect to previous versions

Version	Description
4.00.00	Complete new version of QUICKIN

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2 Introduction to QUICKIN

2.1 Introduction

The main purpose of the QUICKIN program is to create, manipulate and visualise model bathymetries for the Delft3D modules FLOW and WAVE (2 and 3 dimensional flow and transport and 2D short wave propagation) and for the programs Delft1D2D (flood and overland flow); Delft1D2D (2002), SWAN; SWAN (2000). Initial condition fields or parameter fields can also be specified.

Bathymetries for Delft3D-WAVE and SWAN can be defined on a Cartesian or spherical (curvilinear) grid, a bathymetry for Delft1D2D is defined on a rectangular grid.

The grids can be created using the RGFGRID program.

2.2 Program considerations

One of the problems of depth interpolation is that the samples (raw data) may originate from various sources, each of different date, quality and resolution. If these samples are all copied into one large file, the 'high' quality data would be contaminated with 'low' quality data, leading to non optimal interpolation results.

In order to cope with this problem of 'data contamination', the program allows for subsequent opening and interpolation of files. Thus, starting with the best data available, the optimal bathymetry is obtained, because points that have already been interpolated with 'good' quality data, are not overwritten in subsequent steps by interpolation with 'low' quality data.

Since the Delft3D-FLOW and SWAN programs use equations that in fact are averaged over the grid dimensions, the best results are obtained if the model bathymetry approximates the real bathymetry in an averaged sense rather than in a local sense. Therefore, if the sample resolution is higher than the grid resolution, we advise to assign depth values by means of an averaging method. Instead, if there are less sample points than grid points, the depth at grid points has to be interpolated (e. g. with a triangulation interpolation method).

Since the preferred interpolation method may vary over the model area, the QUICKIN program allows you to interactively select the active interpolation area, by means of a polygon, and the desired interpolation method. Also, the classic problem of triangular interpolation over areas that should not be covered by the data, but that may be inside the triangles spanned by the triangle network, can effectively be avoided by means of a polygon. Typically, this kind of situation occurs when a tidal flat is surrounded by channels which have been measured by boat, whereas the flat itself has not been surveyed.

Furthermore, a bathymetry can be created or modified without samples data, by changing grid depth values interactively of by specifying sample data using a polygon. Typically, this is of interest when future planned channels have to be built into an existing model bathymetry. A powerful so-called 'depth diffusion' mechanism is provided, that propagates user-supplied depth information at selected grid points or lines into the model, keeping a smooth transition between the original and the constructed bathymetry. Furthermore, if desired, the bathymetry can be smoothed by the depth smoothing option.

3D viewing is implemented to provide a clear view of bathymetries.

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3 Getting started

3.1 Overview of Delft3D

The Delft3D program suite is composed of a set of modules (components) each of which covers a certain range of aspects of a research or engineering problem. Each module can be executed independently or in combination with one or more other modules.

Delft3D is provided with a menu shell through which you can access the various modules. In this chapter we will guide you through some of the input screens to get the look-and-feel of the program. In the Tutorial, Chapter 6, you will learn to define a simple scenario.

3.2 Starting Delft3D

To start Delft3D:

- ◇ On an MS Windows platform: select *Delft3D* in the *Programs* menu.
- ◇ On Linux machines: type `delft3d-menu` on the command line.

Next the title window of Delft3D is displayed, Figure 3.1.

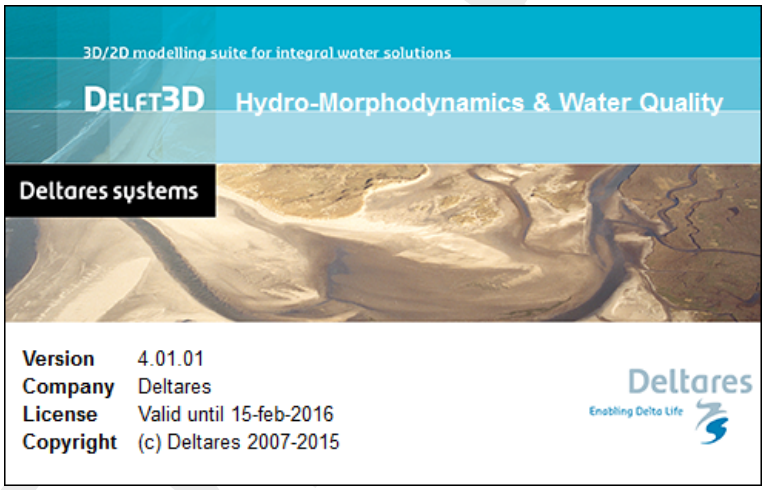

Figure 3.1: *Title window of Delft3D*

After a short while the main window of the Delft3D-MENU appears, Figure 3.2.

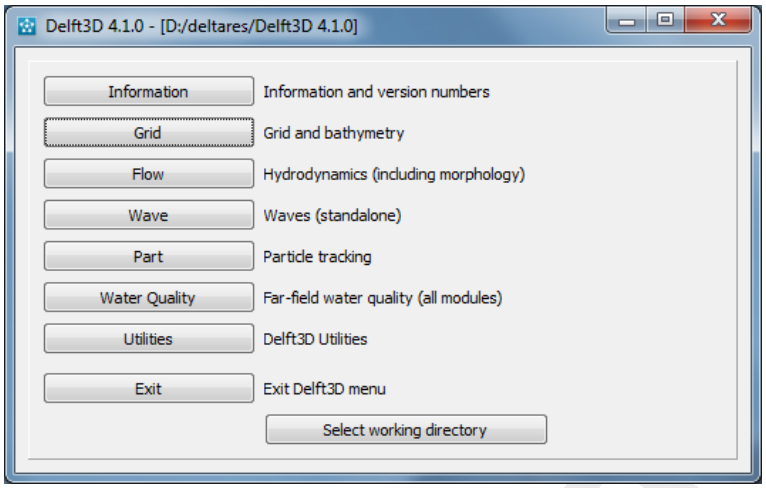

Figure 3.2: *Main window* ***Delft3D-MENU***

Several menu options are shown. For now, only concentrate on exiting Delft3D-MENU, hence:

◇ Click on the *Exit* push button.

The window will be closed and you are back in the Windows Desktop screen for PCs or on the command line for Linux workstations.

Remark:

◇ In this and the following chapters several windows are shown to illustrate the presentation of Delft3D-MENU and QUICKIN. These windows are grabbed from the PC-platform. For Linux workstation the content of the windows is the same, but the colours may be different.

3.3 Getting into QUICKIN

To continue start the menu program again, as indicated in section 3.2.

◇ Click the *Grid* button, see Figure 3.2

Next the selection window for **Grid and bathymetry** is displayed for preparing a curvilinear grid, interpolate data on that grid and aggregate the hydrodynamic cells, see Figure 3.3.

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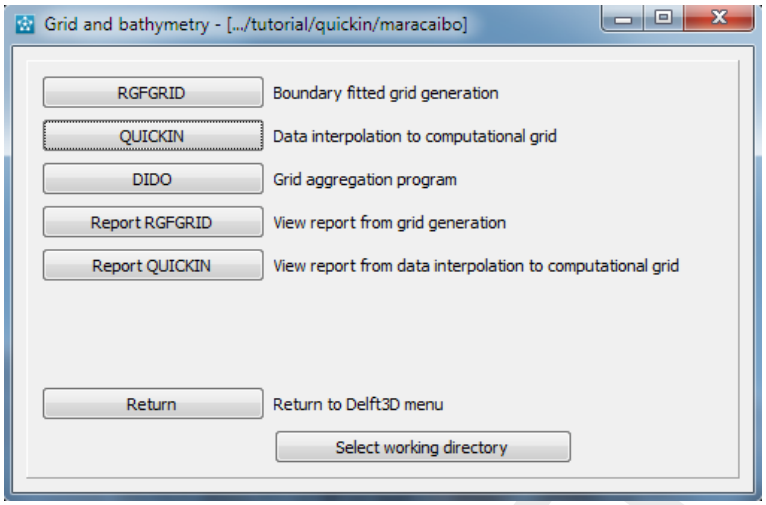

Figure 3.3: *Selection window for* ***Grid and Bathymetry***

Note that in the title bar the current directory is displayed, in our case <D:/delft3d>.

Before continuing with any of the selections of this **Grid and bathymetry** window, you select the directory in which you are going to prepare scenarios and execute computations:

◇ Click the *Select working directory* button.

Next the **Select working directory** window is displayed, see Figure 3.4 (your current directory may differ, depending on the location of your Delft3D installation).

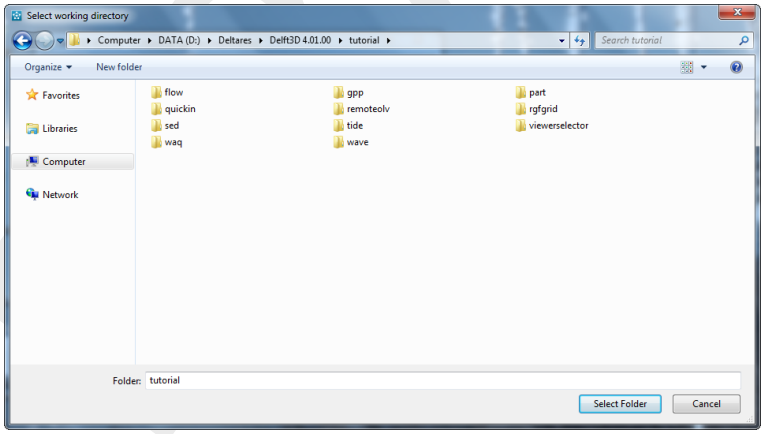

Figure 3.4: Select working directory *window*

◇ Browse to and open the <tutorial> sub-directory of your Delft3D Home-directory.
◇ Open the <quickin> directory.
◇ Enter the <maracaibo> sub-directory and close the **Select working directory** window by clicking button *OK*, see Figure 3.5.

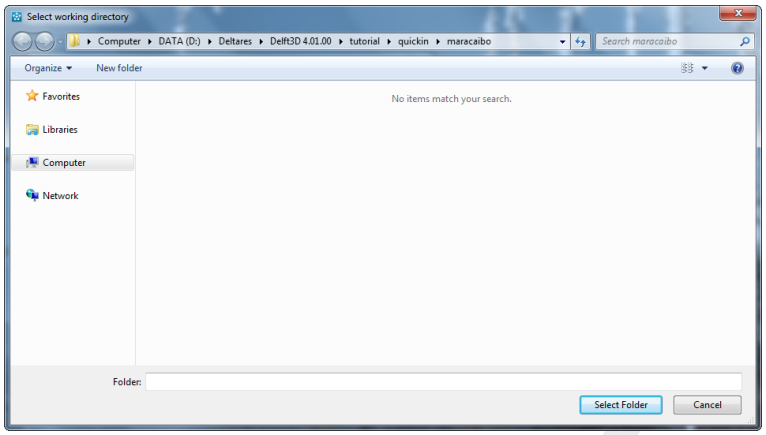

***Figure 3.5: Select working directory** window to set the working directory to <quickin/maracaibo>*

Next the **Grid and bathymetry** window is re-displayed, but now the changed current working directory is displayed in the title bar, see Figure 3.6.

***Figure 3.6:** A part of the current working directory is shown in the title bar due to its length*

Remark:

- In case you want to start a new project for which no directory exists yet, you can select in the **Select working directory** window to create a new folder.
- Click on *QUICKIN* in the **Grid and bathymetry** window, see Figure 3.3.

QUICKIN is loaded and the primary input screen is opened, Figure 3.7.

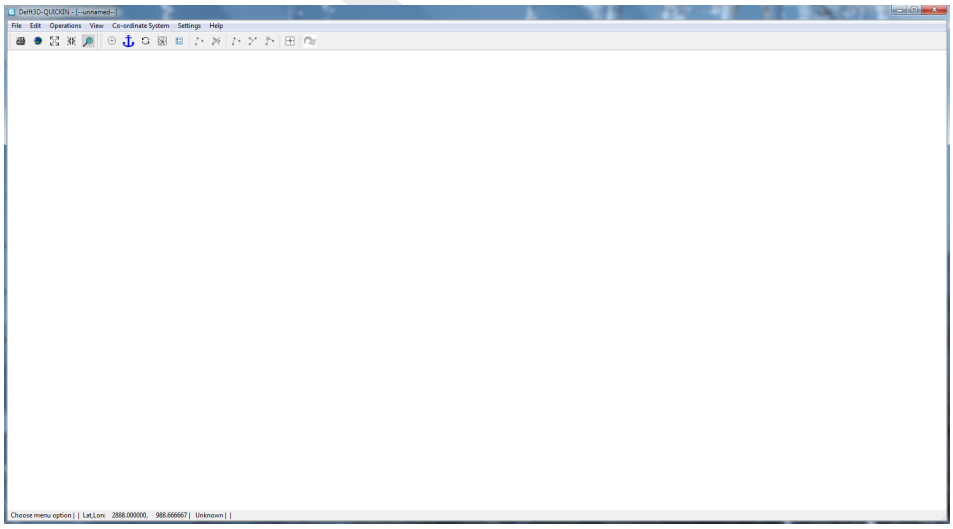

***Figure 3.7:** Main window of the QUICKIN*

In the lower-left corner of the status bar QUICKIN gives additional operational information, see Figure 3.8, such as:

- ◇ User selections.
- ◇ Operational instructions (for instance Toggle anchor mode).
- ◇ x and y co-ordinates of the current cursor position.
- ◇ Co-ordinate system: Cartesian or Spherical.
- ◇ Distance (in metre) to a user-defined anchor point (only displayed when the anchor is activated).

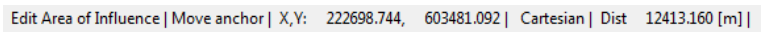

Figure 3.8: *Operational information displayed in the statusbar*

3.4 Exploring some menu options

To open a land boundary:

- ◇ Upon selecting *File* → *Attribute Files* → *Open Land Boundary*, you can open a collection of land boundaries, see Figure 3.9. Land boundaries (or land-water marking) are in files with default mask <∗.ldb>.

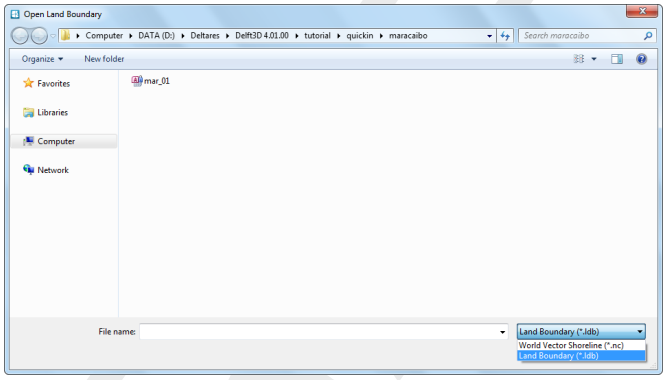

Figure 3.9: *Menu item* File → Attribute Files → Open Land Boundary

Next the **Open Land Boundary** window is displayed, see Figure 3.10.

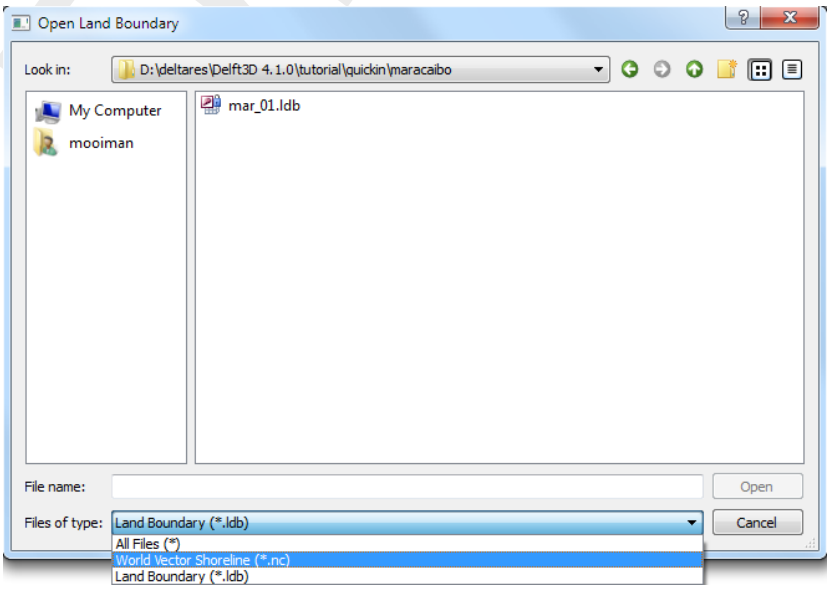

Figure 3.10: *File open window* ***Open Land Boundary***

In the current directory one land boundary file is present.

◇ Select <mar_01.ldb> and click *Open* to open the land boundary file.

Similar open the grid <mar_02.grd> (on the *File* →*Import* →*Grid (RGFGRID)*) and the samples in <mar_02.xyz> (on the *File* →*Attribute Files* →*Open Samples*). After opening these data files the screen looks like as in Figure 3.11.

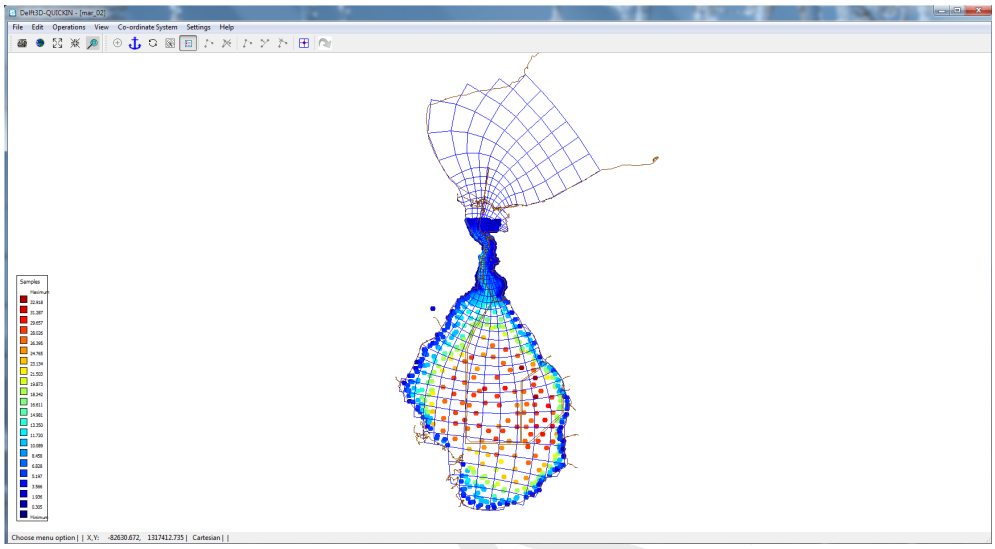

Figure 3.11: *Land boundary, grid and samples for the Maracaibo model*

Since the resolution of samples in the lake is low compared to the grid points, we will use a triangular interpolation to interpolate towards the grid points. First define a polygon

◇ On the *Edit* menu click *Polygon menuarrow New*.
◇ Click with the left mouse to obtain a polygon similar as in Figure 3.12.

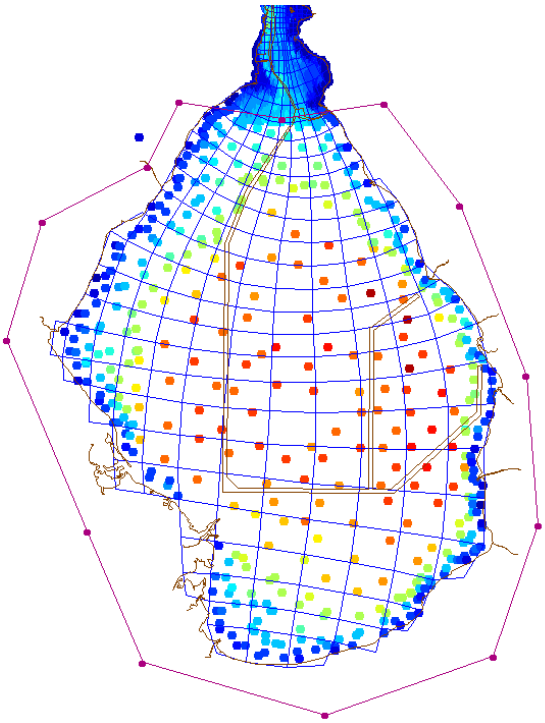

Figure 3.12: *Polygon to enclose the area for triangular interpolation*

To activate the interpolation operation:

◇ On the *Operations* menu, click *Triangular Interpolation*.

Since the samples often do not cover the shore region on land, the grid points at the land-water interface cannot get a depth value from the triangular interpolation.

◇ On the *Operations* menu, click *Grid Cell Averaging*, to obtain Figure 3.13.

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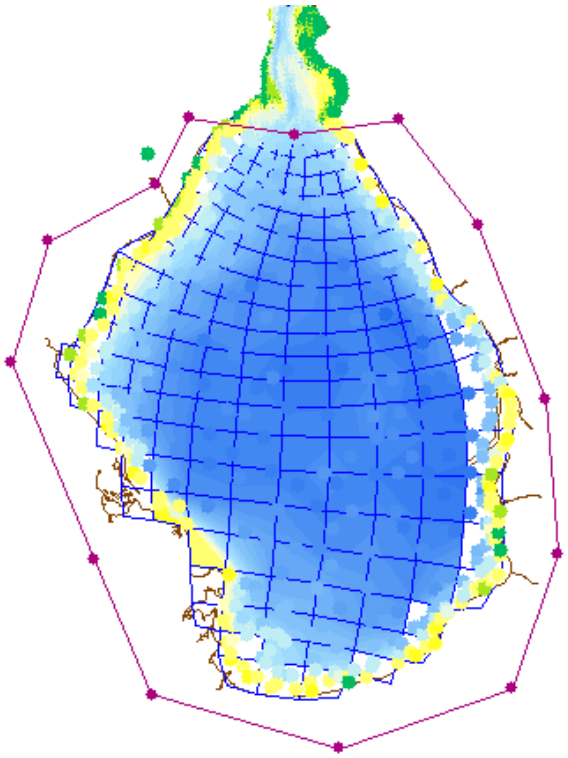

Figure 3.13: *Depth contours in the lake region after triangulation and averaging*

We will now finish generating the depth for the Maracaibo model. Refer to Chapter 6, Tutorial, to finalise the depth.

To save the unfinished depth:

◇ On the *File* menu, point to *Export* and click *Depth*

The **Save As** window opens, see Figure 3.14.

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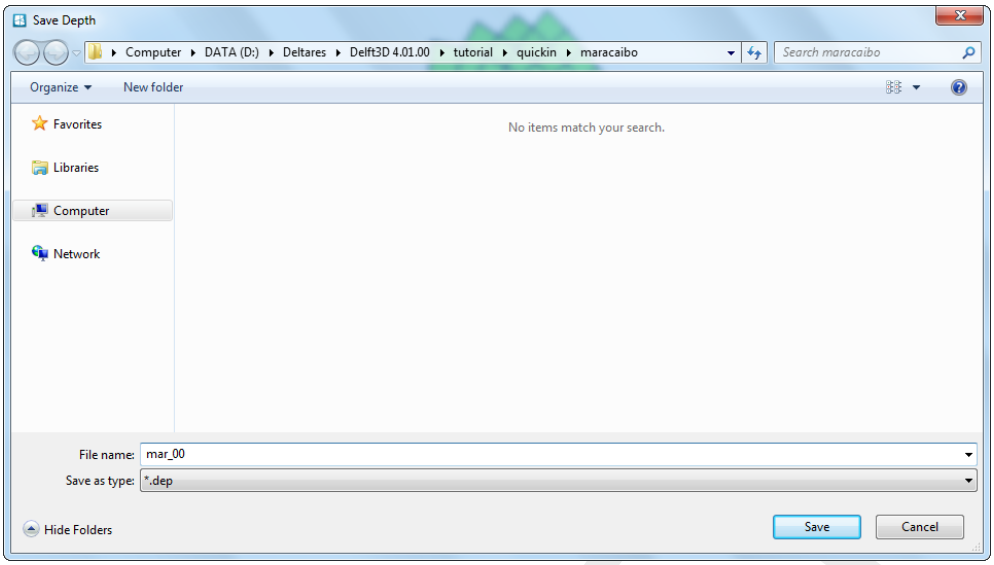

Figure 3.14: *Window* ***Save Depth*** *to save depth files*

You will be back in the main window of QUICKIN.

3.5 Exiting QUICKIN

To exit the QUICKIN

◇ Click *Exit* on the *File* menu.

You will be back in the **Grid and bathymetry** window, see Figure 3.3

◇ Click *Return* to return to the main window of Delft3D-MENU, see Figure 3.2
◇ Click *Exit*.

The window is closed and the control is returned to the desk top or the command line.

In this Getting Started session you have learned to access the QUICKIN and to open and inspect a bathymetry samples file.

We encourage new users next to run the tutorial described in Chapter 6.

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4 General operation

4.1 General program operation instruction

Help

Upon selecting *Help* → *User Manual*, the QUICKIN User Manual in PDF-format will be opened. Use the bookmarks in the contents to locate the subject you are interested in.

File menu

The file-menu is the standard **Open** and **Save As** window. The file mask depends on the type of data that you want to open or save. You can change the directory by navigating through the folders.

It is possible to specify whether to Stay on the Start-up Directory or not, in the **Settings General** form.

General cursor and keyboard functions

The left mouse button activates or confirms desired actions. The `Esc` key cancels the last edit action. The right mouse button may also confirm actions, or may put the program back into its original mode.

4.1.1 Toolbars

The main window contains a men bar and two icon bars. The two icon bars are separated in a main toolbar belonging to the overall handling and a toolbar belonging to specific handling of the program QUICKIN.

4.1.1.1 Main toolbar

The main toolbar is shown in Figure 4.1.

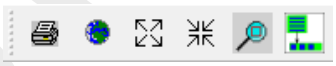

Figure 4.1: *Main toolbar*

Print screen

Press `Ctrl-P` or click on the toolbar to obtain the print window for a hardcopy of the current screen. This file is called <quickin_*date_time*.pdf>

Zoom to extent

Click the icon to zoom to the full extent of the project area.

Zoom in

Click on the toolbar to zoom in.

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Zoom out

Click on the toolbar to zoom out.

Zoom box

To define a zoom box, click on the toolbar and drag a box. If you define a zoom box from right to left and from bottom to top then it will zoom out instead of zoom in.

Menu item to toolbar

When using the icon , the next chosen menu item will be placed in a separate toolbar.

As example, click the icon , and select from the menu *File* → *Import* → *Grid (RGFGRID)*. . . . An extra toolbar will appear with the chosen menu option, see Figure 4.2.

Figure 4.2: *Menu item import* Grid (RGFGRID) *placed into extra toolbar*

4.1.1.2 QUICKIN toolbar

The program specific toolbar, see Figure 4.3, consists of icons which can also be reached via menu options.

Figure 4.3: *QUICKIN specific toolbar*

- Recompute the stereographic projection.
- See section 4.2 key-stroke `A`.
- Refresh the internal administration of the program.
- Select a domain.
- Show or hide the legend.
- Start editting a new polygon, land boundary or spline.
- Delete the slected polygon, land boundary or spline.
- Insert a point into a polygon, land boundary or spline.
- Move a point of a polygon, land boundary or spline.
- Delete a point of a polygon, land boundary or spline.
- Edit a depth point (i.e. scalar value).
- Repeat the previous action.

4.2 Key stroke functions

`A` = Anchor, or on toolbar

When clicking on the toolbar and next pressing the `A` key on the keyboard, a so-called

anchor will appear, which acts as zero-distance point. The distance (in metre) of the present cursor position to this point is displayed in the status bar at the right of the co-ordinate system indicator, see Figure 4.4. Moving the cursor around and pressing `A` again will relocate the anchor. Clicking again will de-activate the anchor.

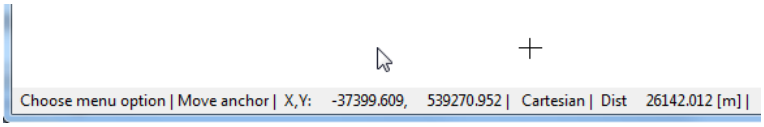

Figure 4.4: *Location of anchor + and distance between anchor and cursor at the right*

`C` = Change
In *Edit* → *Samples,* pressing `C` allows you to change the value of individual samples.

`D` = Delete
In the *Edit* → *Polygon, Depth, Samples* options, pressing `D` allows you to delete individual points (polygon, depth or sample).

`E` = Erase polygon
In *Edit* → *Polygon*, keeping `E` pressed allows you to delete the indicated polygon.

`I` = Insert
In *Edit* → *Polygon*, pressing `I` when the cursor is not on a polygon point allows you to start a new polygon. When the cursor is on a polygon point, pressing `I` allows you to insert polygon points between two points of the indicated polygon.

In *Edit* → *Samples*, pressing `I` allows you to create samples.

`Ctrl-P` = Print screen
Pressing `Ctrl-P` will open the print window. The current screen will be printed to your printer or to a file.

`R` = Replace
In *Edit* → *Polygon* or *Edit* → *Observation Area*, pressing `R` allows you to replace (move) individual points.

`Mouse wheel`
Use the mouse wheel to zoom in and zoom out. Other ways are:

Click on the toolbar to zoom in.

Click on the toolbar to zoom out.

To define a zoom box, click on the toolbar and drag a box.

`Ctrl +` = Zoom in
Keep the `Ctrl`-key pressed and use the + key to zoom in more.

`Ctrl -` = Zoom out
Keep the `Ctrl`-key pressed and use the - key to zoom in more.

`Ctrl` move cursor = move focus of screen
Keep the `Ctrl`-key pressed and move the cursor around. The current screen will move ac-

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cordingly.

`Ctrl` arrow keys = move focus of screen left, right, up or down
Keep the `Ctrl`-key pressed and use the arrow keys to move the focus of the screen accordingly.

`Esc` = Undo
In various edit modes the latest action will be undone pressing `Esc` .

`Tab` = depth cursor
In menu *Edit* → *Depth* and menu item *Depth Linear,* pressing the `Tab` key while the cursor is on a grid point, will display the depth value in the lower status bar. In normal view (not in *3D View*), you can press the `Tab` key to go into 'depth cursor mode'. This allows you to 'walk' over the depth points using the arrow keys. When in 'depth cursor mode' you can increase or decrease the depth values by using the + and - keys, respectively.

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5 Menu options

The menu bar contains the following items, see Figure 5.1, each item is discussed in a separate sections

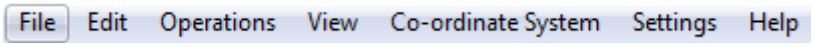

Figure 5.1: *QUICKIN menu options*

5.1 File menu

When opening a land boundary or polygon before opening the grid file be sure you choose the same co-ordinate system as the grid file you want to load, see section 5.5.

- ◇ When opening files, QUICKIN will not check the co-ordinate system in the file against the current co-ordinate system in QUICKIN, except when opening a grid.

On the *File* menu, see Figure 5.2, options are available to import land boundaries, samples, depth files and grid files. The results at each stage of the bathymetry definition process can be saved. The option to quit QUICKIN is located here also.

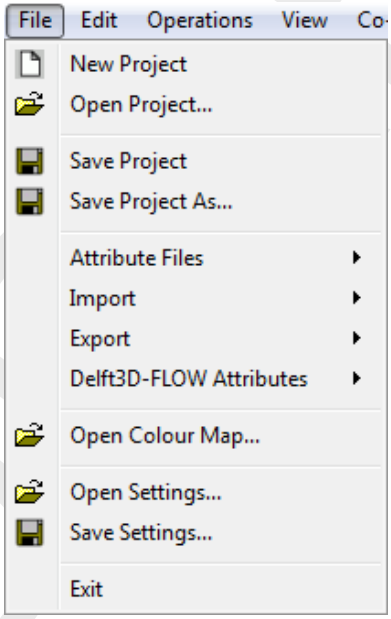

Figure 5.2: *Options on the* File *menu*

The start-up directory to open and save files can be configured in the **General Parameters** form on the menu *Settings* →*General*. As default the file menu starts at the last directory selected.

For the formats of the files you are referred to Appendix A.

5.1.1 New project

Upon selecting *File* →*New Project*, all objects (land boundaries, polygons, grids, depths, samples etc.) will be deleted; i.e. you start from scratch.

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5.1.2 Open project

Upon selecting *File →Open Project,* the **Open Project** window appears in which you can browse to an existing project (<∗.d3d> file).

Remark:

- ◇ A project saved by RGFGRID or D-Waq DIDO can be read by QUICKIN.

5.1.3 Save project

Upon selecting *File →Save Project*, the current project (filenames for grid and depth) will be saved under the same name. If the project name is not known yet, the **Save Project** window appears.

Remark:

- ◇ When you started with an existing project, or when you saved the project before, saving the project will not save changes you have made to the depth(s). Either use **Save Project As** or save individual depths.

5.1.4 Save project as

Upon selecting *File →Save Project As*, the current project can be saved under a different name.

5.1.5 Attribute files

On the *File →Attribute Files* sub-menu, see Figure 5.3, options are available to open and save objects that are indirectly related to the grids.

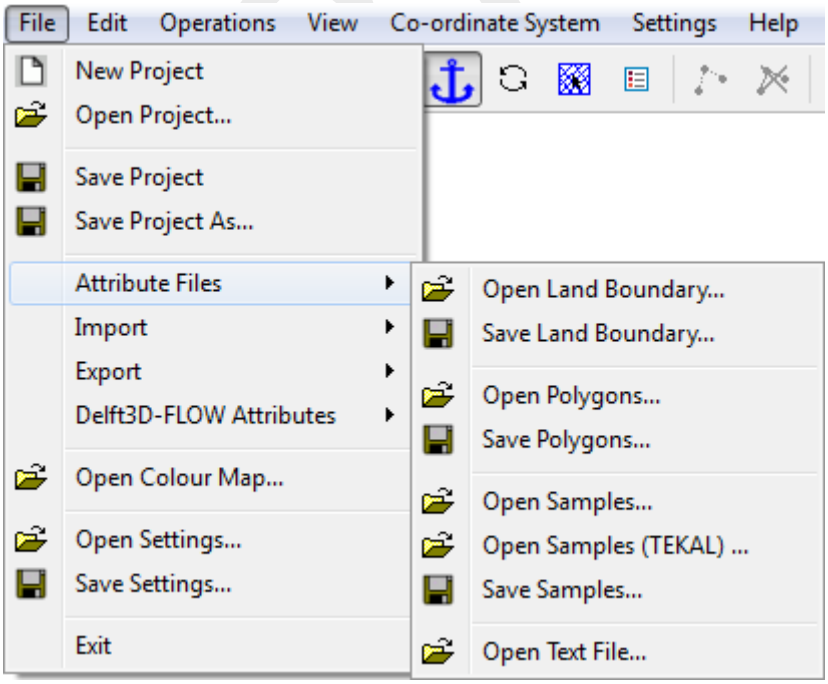

Figure 5.3: *Options on the* File→Attribute Files *menu*

Open land boundary

Upon selecting *File →Attribute Files →Open Land Boundary*, you can open a collection of land boundaries. Land boundaries (or land-water marking) are in files with default mask $<*$.ldb$>$.

Remark:

- ◇ If you open another land boundary file, it will be visualised together with the existing land boundary.

Save land boundary

Save the land-boundary, e.g. after it has been edited. Land boundary files have as default mask $<*$.ldb$>$.

Open polygon

Upon selecting *File →Attribute Files →Polygons,* you can open a collection of polygons from a file with mask ($<*$.pol$>$). Polygons are per definition closed. If the polygon is not closed in the file it will still be shown as closed.

Remark:

- ◇ If you open another polygons file, they will be visualised together with existing polygons.

Save polygon

When saving polygons, each polygon will be saved as a closed polyline. A polygon file has as default mask $<*$.pol$>$.

Open samples

The samples in a file with mask $<*$.xyz$>$, may be a set of disordered x, y, z values given in a sequential list of free-formatted x, y, z values.

Remark:

- ◇ If you open another samples file, the samples will be visualised together with existing samples.

Open TEKAL samples

In this file both the depth values and the grid information are contained. In order to use this option you must have saved the bathymetry in TEKAL format (on the *File* menu, point to *Export* and click *Grid and Depth (TEKAL)*.

Save samples

The program offers the facility to insert additional samples, delete or replace samples. The modified data set of samples can then be saved as a sequential list of free-formatted x, y, z values.

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Open text file

Texts can be displayed in the graphics area if their position (x, y), the text and colour are defined. See an example in section A.12.

5.1.6 Import

On the *Import* sub-menu, see Figure 5.4, options are available to import objects that are directly related to the grids.

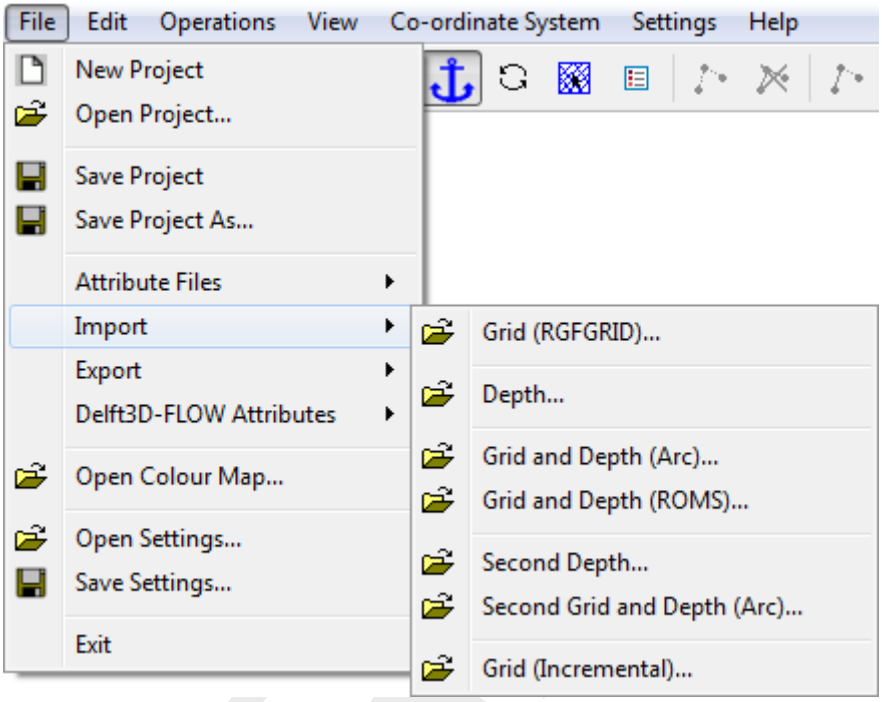

Figure 5.4: File →Import *options*

Grid (RGFGRID)

Upon selecting *File →Import →Grid (RGFGRID)*, you can open a collection of grids. The grid file has a default mask <∗.grd>.

Remarks:

- ◇ The co-ordinate system in QUICKIN is set accordingly to the system specified in the grid file.
- ◇ If the co-ordinate system is spherical then the co-ordinates are shown in stereographic projection.
- ◇ If no co-ordinate system is specified, Cartesian is presumed.

Depth

Interpolated depth values in a file with mask <∗.dep> can be opened in the Delft3D-FLOW depth-file format.

Grid and Depth (Arc)

This option is relevant to users of Delft1D2D. Upon selecting *File* $\rightarrow$*Import* $\rightarrow$*Grid and Depth (ARC)*, you can open a single grid. This GIS file contains both a rectangular grid and bathymetry definition in one file. The file has mask $<*.a*>$. If the extension chosen is $<$amu$>$, QUICKIN assumes that a Delft1D2D map-file of u-velocity components has to be opened and the v-velocity components in file $<*.amv>$ are automatically opened as well. The resulting velocity vector field will be displayed and can be shown on a map of the Delft1D2D bathymetry. A description of this file format is given in section A.7.

Grid and Depth (ROMS)

Upon selecting *File* $\rightarrow$*Import* $\rightarrow$*Grid and Depth (ROMS)*, you can open a grid in the NetCDF format as used for the Regional Ocean Modelling Sytem (ROMS).

Second depth

A second file of interpolated depth values can be opened in a file with mask $<*.dep>$. This second depth field can be subtracted from or added to the present depth values (e. g. adding a non-uniform mean sea level correction to the present depth values), see menu *Operations* $\rightarrow$*Combine Depth and Second Depth*.

Second Grid and Depth (Arc)

After you have opened a bathymetry in a file with mask $<*.adp>$, you can open water levels in a file with mask $<*.amz>$, to be displayed together with the bathymetry.

Grid (incremental)

After you have opened a ARC-grid (*Grid and Depth (ARC)*) file with mask $<*.aht>$, you can open a incremental result file $<*.inc>$ from Delft1D2D. This file can be used for animation in QUICKIN.

5.1.7 Export

On the *File* $\rightarrow$*Export* sub-menu, see Figure 5.5, options are available to export objects that are directly related to the grids.

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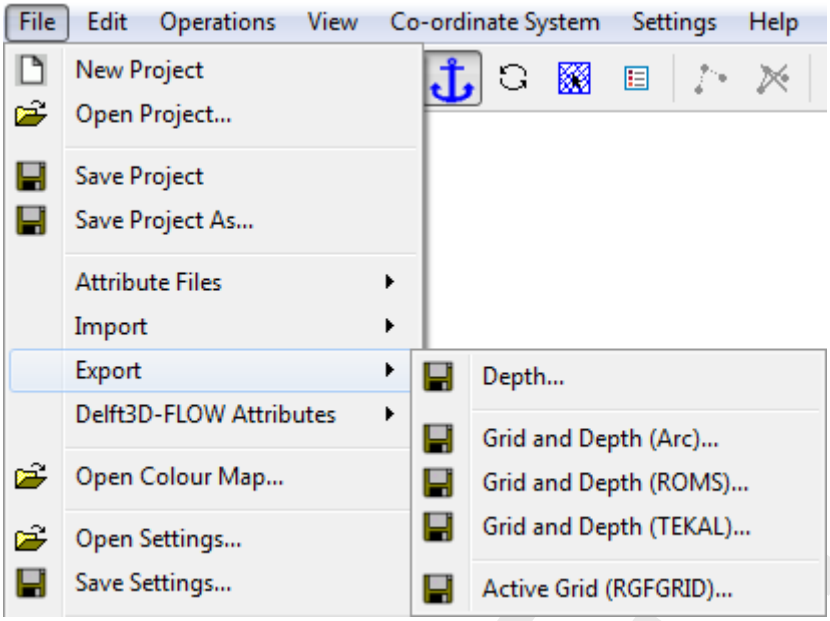

Figure 5.5: File →Export *sub-menu options*

Depth

Interpolated depth values can be saved in the Delft3D-FLOW depth-file format. The default mask is <∗.dep>. If you need to specify a different extension (initial or rougness data) enter the required filename and extension, and add as last character a dot (ex. <waterlevel.ini.> the file on disk will be named <waterlevel.ini>). Another possibility is to rename the filename after it is saved.

Grid and depth (Arc)

Save the bathymetry and rectangular grid definition.

Grid and depth (ROMS)

Save the grid and depth values in a NetCDF file which can be used with ROMS (Regional Ocean Model.System).

Grid and depth (TEKAL)

This file can be used in the Deltares | Delft Hydraulics standard plotting packages as Delft3D-QUICKPLOT and GPP, QUICKPLOT (2013) and GPP (2013).

Active grid (RGFGRID)

After you have interpolated depth values on the grid, some parts of the grid may not be covered with data, e.g. if these parts fall on land. In that case this option gives an easy way to 'cut' away those parts of the grid that are not interpolated. A new grid is written to a file with mask <∗.grd>, that only contains active grid cells, plus a so-called 'computational grid enclosure' file with mask <∗.enc>, see the Delft3D-FLOW User Manual Delft3D-FLOW (2013), that indicates the border of the computational domain in Delft3D-FLOW computations.

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5.1.8 Delft3D-FLOW attributes

Dry points, thin dams and observation points for the hydrodynamic module Delft3D-FLOW can be defined in two ways: either using the **Visualisation Area** window of the FLOW Graphical User Interface, or, using QUICKIN. The (sediment) dredge and dump areas and their characteristics can only be defined in QUICKIN, see Figure 5.6.

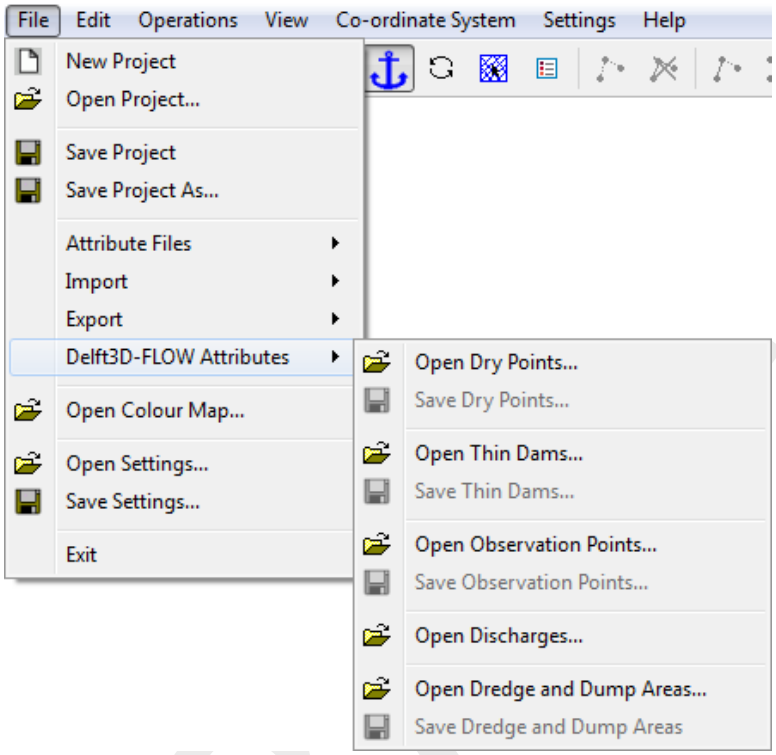

Figure 5.6: *Open and save Delft3D-FLOW attribute files*

Open dry points

Open a file with Delft3D-FLOW dry points. This file has mask <∗.dry>. See section 5.2.10 for details how to define these points.

When opening a file with dry points and dry points are already defined, then the latter will be removed.

Save dry points

Save the dry points to a file with mask <∗.dry>. A description of this file format is given in section A.9.

Open thin dams

Open a file with Delft3D-FLOW thin dams. This file has mask <∗.thd>. See section 5.2.11 for details how to define these points.

When opening a file with thin dams and thin dams are already present, then the latter will be removed.

Save thin dams

Save the thin dams to a file with mask <∗.thd>. A description of this file format is given in section A.10.

Open observation points

Open a file with Delft3D-FLOW observation points. This file has mask <∗.obs>. See section 5.2.12 for details how to define these points.

When opening a file with observation points and observation points are already defined, then the latter will be removed.

Save observation points

Save the observation points to a file with mask <∗.obs>. A description of this file format is given in section A.11.

Open discharges

Open a file with Delft3D-FLOW discharges. This file has mask <∗.src>. It is not possible to define discharge location, type and time-series, in that case you have to use FLOW-GUI.

When opening a file with discharges and discharges are already present, then the latter will be removed.

Open dredge and dump areas

Open the file that contains the dredge and dump areas (defined in a separate polygon file), the depths to be dredged and the links between dredge and dump areas. The file has mask <∗.dad>.

Save dredge and dump areas

Save the dredge and dump areas (defined in a separate polygon file), the depths to be dredged and the links between dredge and dump areas. The file has mask <∗.dad>. When asked to save the polygon file, click *Yes* when not yet saved.

5.1.9 Open Colour map

You can choose from a number of pre-defined colour schemes (in file with masks <∗.clr> or <∗.clrmap>). These colour schemes have the same format as used for Delft3D-QUICKPLOT, see section A.14 for the file format.

Restriction:
- ◇ Only the colour space `RGB` is supported

Remark:
- ◇ If the file <quickin.clrmap> exists on the start-up directory then this file will be read, if the file does not exist on the start-up directory it will try to read the file on the installation directory <$D3D_HOME/$ARCH/plugins/default>.

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5.1.10 Open Settings

If you have saved your QUICKIN settings in a previous session, you can open these settings again, see section A.15 for the file format.

Remark:

- If the file <quickin.clrmap> exists on the start-up directory then this file will be read, if the file does not exist on the start-up directory it will try to read the file on the installation directory <$D3D_HOME/$ARCH/plugins/default>.

5.1.11 Save Settings

If you have made changes in one of the forms on the *Settings* menu, you can save these settings to be used later on again.

5.1.12 Exit

Exit from the QUICKIN program

5.2 Edit menu

Several edit modes are presented on the *Edit* menu, see Figure 5.7. An edit mode is an operation mode which needs at least a mouse click, i.e. a set of operation instructions which is valid for a certain data set, and which may go with some specific display method. The following objects may be modified:

- Land boundary
- Polygon
- Depth
- Samples
- Delft3D-FLOW attributes (dry points, thin dams, observation points or dredge and dump areas)

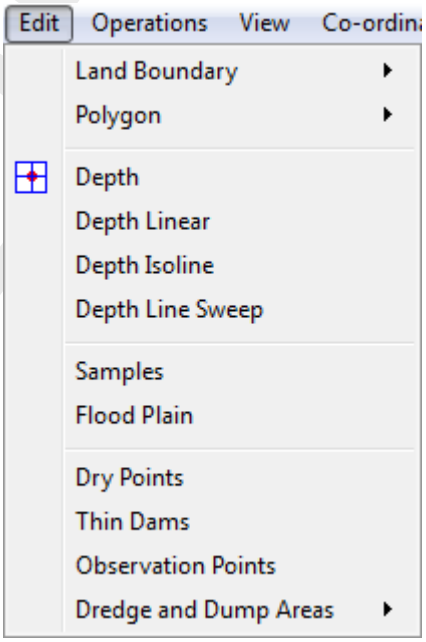

Figure 5.7: *Options on the* Edit *menu*

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`Esc` = Undo
In most edit modes, `Esc` will undo the latest action.

5.2.1 Land boundary

The land boundary is used to visualise the land-water interface. To edit (define or modify) a land boundary, possible edit actions see Figure 5.8.

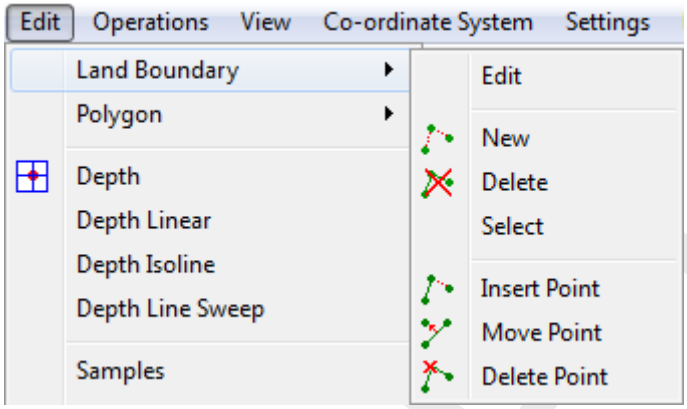

Figure 5.8: *Options on the* Edit →Land Boundary *menu*

5.2.1.1 Menu options

The key stroke to reach the menu item *Edit* →Land Boundary →*Edit* is: `CTRL+ALT+L`

Edit

Upon selecting *Edit* →*Land Boundary* →*Edit*, you can start editting a polyline that defines an Land Boundary. When there is no polyline the edit mode is set to *New*, otherwise you have to select first a polyline (from the menu *Edit* →*Land Boundary* →*Select* or press the key `s`). After you have selected the polyline you can use key-strokes, icons in the toolbar or menu items to switch the edit mode.

New

Upon selecting *Edit* →Land Boundary →*New*, you can start to define a new polyline, click on , or use the key-stroke `n` to start a new polyline.

Delete

Upon selecting *Edit* →*Land Boundary* →*Delete*, click on , or use the key-stroke `e`, to delete (erase) the selected polyline.

Select

Upon selecting *Edit* →*Land Boundary* →*Select*, or use the key-stroke `s`, you can select a polyline by clicking on one of its edges or vertices. After that the polyline will be highlighted

Insert point

Upon selecting *Edit* →*Land Boundary* →*Insert Point*, click on , or use the key-stroke `i`, you can insert a point into the selected polyline.

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In *Edit* →*Land Boundary*, pressing `I` starts the vertex insert action depending on the first click on the screen, there are two options.

Normal	If the first click is in between two vertices of the land boundary then a point will be inserted in the closest edge.
Incremental	If the first click is on a vertex of the existing lad boundary the incremental insert option is started, which means all next locations click by the left mouse button are added to the polygon behind the indicated point. This mode will be cancelled when indication a existing point of the polygon and the normal insert option will be used. Hitting another key will also cancel this insert option.

The message at the left of the statusbar now reads 'Insert a point', click the left mouse to insert individual points.

Move point

Upon selecting *Edit* →*Land Boundary* →*Move Point*, click on , or use the key-stroke `r`, you can move (replace) a point on the selected polyline.

Delete point

Upon selecting *Edit* →*Land Boundary* →*Delete Point*, click on , or use the key-stroke `d`, you can delete a point on the selected polyline by indicating it.

5.2.1.2 Valid action keys are

The key stroke to reach the menu item *Edit* →Land Boundary →*Edit* is: `CTRL+ALT+L`

In *Edit* →*Land Boundary* mode the following keys can be used (mode is indicated in the statusbar):

- Key `a`: Add point after
  Add a point after the last point of a selected land boundary (after)
- Key `b`: Add point before
  Add a point before the first point of a selected land boundary (before)
- Key `d`: Delete single point
  delete single point in selected land boundary
- Key `i`: Insert
  In *Edit* →*Land Boundary*, pressing `I` starts the vertex insert action depending on the first click on the screen, there are two options.

Normal	If the first click is in between two vertices of the land boundary then a point will be inserted in the closest edge.
Incremental	If the first click is on a vertex of the existing lad boundary the incremental insert option is started, which means all next locations click by the left mouse button are added to the polygon behind the indicated point. This mode will be cancelled when indication a existing point of the polygon and the normal insert option will be used. Hitting another key will also cancel this insert option.

  The message at the left of the statusbar now reads 'Insert a point', click the left mouse to insert individual points.
- Key `r`: Move (replace) single point
  Replace single point in the selected land boundary
- Key `s`: Select land boundary

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Select a land boundary
◇ Key x: Delete land boundary
Delete a complete land boundary

5.2.2 Polygon

The Area of Interest polygon is used to limit the area of influence of operations and or edit actions. All grid points and samples that are inside the polygon are active in the subsequent interpolation or manipulation steps. The polygon is self closing. see Figure 5.9.

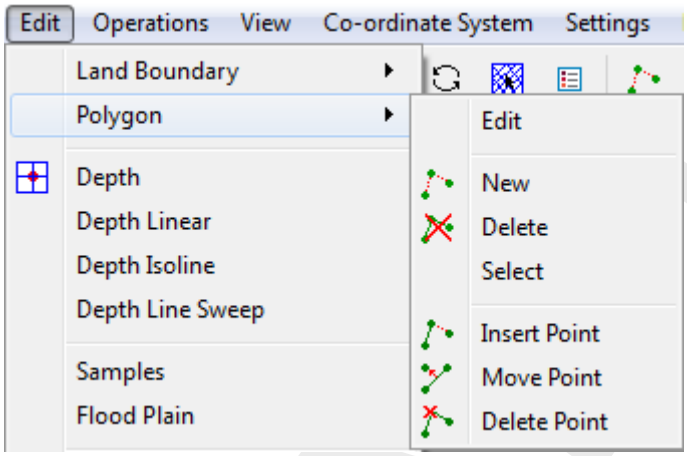

Figure 5.9: *Options on the* Edit →Area of Interest *menu*

5.2.2.1 Menu Options

The key stroke to reach the menu item *Edit* →Polygon →*Edit* is: CTRL+ALT+P

Edit

Upon selecting *Edit* →*Polygon* →*Edit*, you can start editting a polygon that defines an Area of Interest. When there is no polygon the edit mode is set to *New*, otherwise you have to select first a polygon (from the menu *Edit* →*Polygon* →*Select* or press the key s). After you have selected the polygon you can use key-strokes, icons in the toolbar or menu items to switch the edit mode.

New

Upon selecting *Edit* →Polygon →*New*, you can start to define a new polygon, click on , or use the key-stroke n to start a new polygon.

Delete

Upon selecting *Edit* →*Polygon* →*Delete*, click on , or use the key-stroke e, to delete (erase) the selected polygon.

Select

Upon selecting *Edit* →*Polygon* →*Select*, or use the key-stroke s, you can select a polygon by clicking on one of its edges or vertices. AFter that the polygon will be highlighted

Insert point

Upon selecting *Edit* →*Polygon* →*Insert Point*, click on , or use the key-stroke `i`, you can insert a point into the selected polygon.

In *Edit* →*Polygon*, pressing `I` starts the vertex insert action depending on the first click on the screen, there are two options.

Normal	If the first click is in between two vertices of the polygon then a point will be inserted in the closest edge.
Incremental	If the first click is on a vertex of the existing polygon the incremental insert option is started, which means all next locations click by the left mouse button are added to the polygon behind the indicated point. This mode will be cancelled when indication a existing point of the polygon and the normal insert option will be used. Hitting another key will also cancel this insert option.

The message at the left of the statusbar now reads 'Insert a point', click the left mouse to insert individual points.

Move point

Upon selecting *Edit* →*Polygon* →*Move Point*, click on , or use the key-stroke `r`, you can move (replace) a point on the selected polygon.

Delete point

Upon selecting *Edit* →*Polygon* →*Delete Point*, click on , or use the key-stroke `d`, you can delete a point on the selected polygon by indicating it.

The polygon will remain valid after each operation, but it can be deleted, via menu *Edit* →*Polygon* →*Delete*. The polygon can be used as a so-called 'fault line' in the interpolation process.

Upon selecting *Edit* →*Polygon*, you can start to define a new polygon, or click on to start a new polygon.

Note: To define dredge and dump areas go to the *Edit* menu, point to *Dredge and Dump Areas* and click *New Area*.

5.2.2.2 Valid action keys are

The key stroke to reach the menu item *Edit* →Polygon →*Edit* is: `CTRL+ALT+P`

In *Edit* →*Polygon* mode the following keys can be used:

- Key `d`: Delete
  Pressing `d` allows you to delete individual polygon points.
- Key `e`: Erase polygon
  Entire polygon sections are deleted. Press key `e` and then click with the left mouse button on a point of the polygon which need to be deleted. Finish the operation by pressing the right mouse button.
- Key `i`: Insert
  In *Edit* →*Polygon*, pressing `i` starts the vertex insert action depending on the first click on

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the screen, there are two options.

Normal	If the first click is in between two vertices of the polygon then a point will be inserted in the closest edge.
Incremental	If the first click is on a vertex of the existing polygon the the incremental insert option is started, which means all next locations click by the left mouse button are added to the polygon behind the indicated point. This mode will be cancelled when indication a existing point of the polygon and the normal insert option will be used. Hitting another key will also cancel this insert option.

The message at the left of the statusbar now reads 'Insert a point', click the left mouse to insert individual points.

◇ Key `n`: New polygon
Pressing `n` allows you to start drawing a new polygon.

◇ Key `r`: Replace
Pressing `r` allows you to replace (move) individual polygon points. The message at the left of the statusbar now reads 'Replace: Get a Vertex'. If you have got it by clicking the left mouse, the message will read 'Replace: Put a Vertex', and you can do so by clicking the left mouse at the new desired position.

5.2.3 Depth

By clicking on a grid point, a window opens in which the depth value is displayed. You can change the value manually. The depth value -999.000 indicates the grid point has no depth value (missing value).

To delete individual depth points, first press `D` and click on the grid point. Press `C` or `I` to go back in the edit mode.

`Tab` = depth cursor
In menu *Edit* →*Depth* and menu item *Depth Linear* pressing the `Tab` key while the cursor is on a grid point, will display the depth value in the lower status bar. In normal view (not in *3D View*), you can press the `Tab` key to go into 'depth cursor mode'. This allows you to 'walk' over the depth points using the arrow keys. When in 'depth cursor mode' you can increase or decrease the depth values by using the + and - keys, respectively.

Press the `D` key to delete the current depth value. Press `Esc` to undo the latest changes. Press `Tab` again to go into normal cursor mode. The depth value and the (M, N) indices of the current depth point are given in the status bar at the bottom of the screen.

5.2.4 Depth linear

Manually interpolate a line of grid depth values, by clicking two points in the grid that have valid depth values. The points in between the two grid points will be linearly interpolated in between the values of the end points. This edit option, in combination with *Operations* →*Internal Diffusion*, provides a very powerful way to build new bathymetries or modify existing ones.

See this combination like the construction of a ship. First, a ships framework is built, (lines of grid depth values) then, its plates are welded to the frame (*Internal Diffusion*).

Reject a result by pressing `Esc`. If the desired end points do not yet have valid depth values, first assign depth values by putting the cursor on top of these points and pressing `Tab`. The + or - keys will increase or decrease the depth value.

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5.2.5 Depth isoline

The operation described above can also be performed in iso-line mode. The value of the iso-line is taken as the value of the FIRST point that has been indicated.

5.2.6 Depth line sweep

Indicate two points on the same grid line. The grid points on the indicated grid line will be copied onto the grid lines parallel to the indicated line. Use the polygon to limit the effective area.

5.2.7 Samples

Samples can be inserted (with a specified depth value), replaced or deleted in the same way as the points of a polygon. The value of the marked sample is displayed in the status bar at the bottom of the screen together with the x and y co-ordinates and the distance from the anchor. The value of the marked sample can then be modified by pressing the + (higher) or - (lower) key (or press `D` for delete or press `Esc` for restore). In edit mode after pressing the `C`-key, sample values can be modified and after pressing the `I`-key, new sample values can be inserted.

5.2.8 Check dike heights

It allows you to quickly check whether the dykes in a Delft1D2D schematisation start overtopping at the proper water level. (Typically useful in a polder area divided in different compartments). First open a Delft1D2D bathymetry $<*$.adp$>$. Next choose this option and click some depth point from which you want to 'release' water at the level (positive up) that you specify by typing a value. Next, water is 'released' from that point and the surrounding bathymetry is 'filled' until the water is stopped either by dykes or high grounds. Increase the 'release level' until dykes start flooding. The wetted area is displayed by means of the 'second depths', see *View* $\rightarrow$*Second Depth*.

5.2.9 Edit Second Depth Animate Incremental

The option allows for animation of the flooding process computed by Delft1D2D. First, open a Delft1D2D bathymetry $<*$.adp$>$ and then choose this option. Open the relevant incremental file $<*$.inc$>$ and press the space bar to start the animation. The animation can be stopped (and restarted) by pressing the space bar again, and be propagated over 1 hour intervals by pressing the +-key. The wetted area is displayed by means of the 'second depths', see *View* $\rightarrow$*Second Depth*.

5.2.10 Dry points

Dry points are grid cells centred around a water level point that are permanently dry during a computation, irrespective of the local water depth and without changing the water depth as seen from the wet points. In QUICKIN dry points are specified as single points. In the Delft3D-FLOW GUI they can also be defined as a line of points.

Click inside a grid cell to define it as dry point. Click on an existing dry point to delete this point.

Remark:

- ◇ Dry points for the hydrodynamic module Delft3D-FLOW can be defined in two ways: either using the **Visualisation Area** window of the Delft3D-FLOW Graphical User Inter-

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face, or using QUICKIN.

5.2.11 Thin dam points

Thin dams are infinitely thin objects defined at the velocity points which prohibit flow exchange between the two adjacent computational cells without reducing the total wet surface and the volume of the model. The purpose of a thin dam is to represent small obstacles (e. g. breakwaters, dams) in the model which have sub-grid dimensions, but large enough to influence the local flow pattern. Thin dams are specified at the edges of a grid cell. In QUICKIN thin dams are specified as single grid edges. In the Delft3D-FLOW GUI they can also be defined as a line of vortices.

Click at a grid vortex to define it as thin dam. Click on an existing thin dam to delete this point.

Remark:

- ◇ Thin dams for the hydrodynamic module Delft3D-FLOW can be defined in two ways: either using the **Visualisation Area** window of the Delft3D-FLOW Graphical User Interface, or using QUICKIN.

5.2.12 Observation points

Observation points are used to monitor the time-dependent behaviour of one or all computed quantities as a function of time at a specific location, i.e. water elevations, velocities, fluxes, salinity, temperature and concentration of the constituents. Observation points represent an Eulerian viewpoint at the results. Observation points are located at cell centres, i.e. at water level points.

Click inside a grid cell to define it as observation point; specify a name (maximum of 20 characters) for the point. Click on an existing observation point to delete this point.

Remark:

- ◇ Observation points for the hydrodynamic module Delft3D-FLOW can be defined in two ways: either using the **Visualisation Area** window of the Delft3D-FLOW Graphical User Interface, or using QUICKIN.

5.2.13 Dredge and dump areas

The *Edit* →*Dredge and Dump Areas* menu item contains several items to define and edit the dredge and dump areas, see Figure 5.10, each item is discussed in a separate sections.

First you have to define the locations of dredge and dump areas by editing polygons. For each area a polygon is required. Next you give each area a meaningful name. Click the name field and specify the polygon name, reflecting for instance if it will be a dredge or a dump site, and specify a drege depth (if applicable).

The next step is to link (connect) each dredge area to a dump area. Individual links can be deleted

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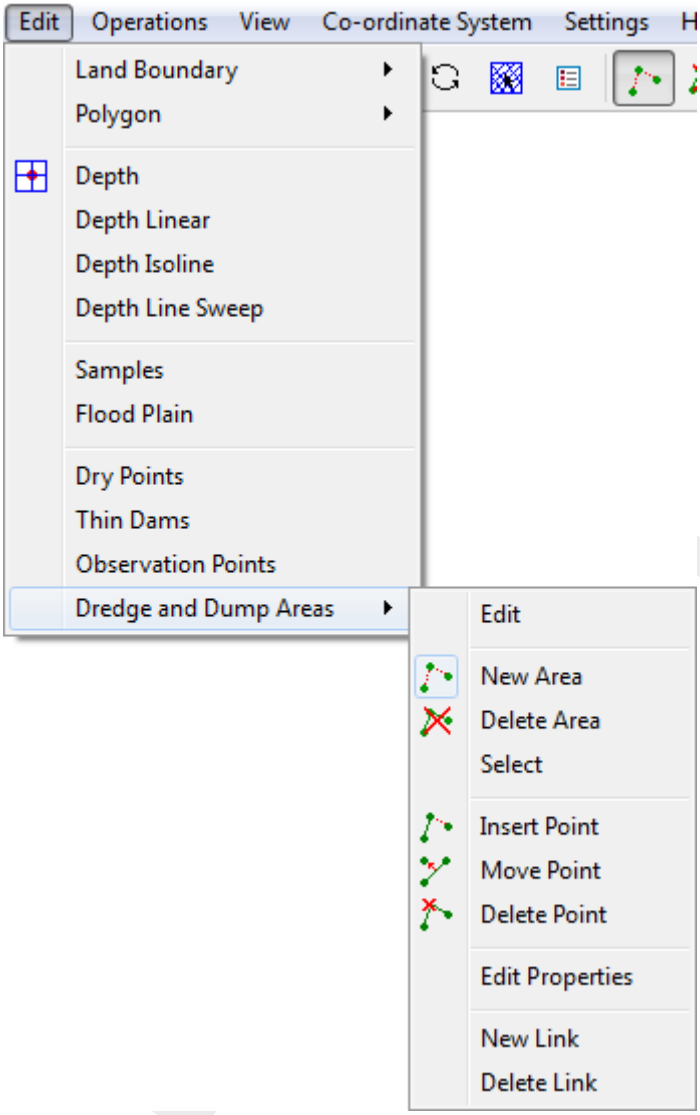

Figure 5.10: *Options on the* Edit →Dredge and Dump Areas *sub-menu*

New area

First you have to define the locations of dredge and dump areas by editting polygons. Select *Edit →Dredge and Dump Areas →New Area* and start defining a new area. Pressing the right-mouse button will stop defining the current polygon and the next left-mouse click will start a new area (polygon).

Edit properties

By pressing *Edit →Dredge and Dump Areas →Edit Properties* you can edit the properties of a dredge/dump area (i.e. name of area and the dredge depth, -999.000 means no dredging), see Figure 5.11.

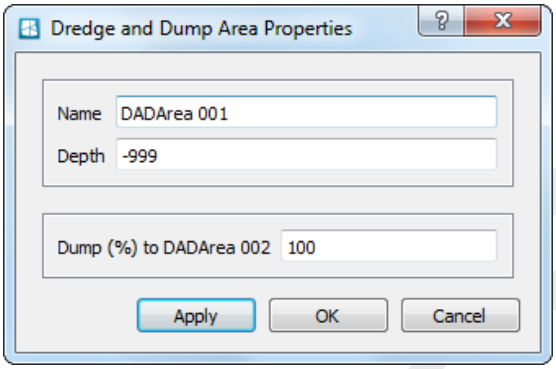

Figure 5.11: *Options on the* ***Dredge and Dump Properties*** *window for a dredge area*

If the area is a dredge area you have also to specify the amount of dredge material (percentages) which will be dumped in the linked dump areas, see Figure 5.12.

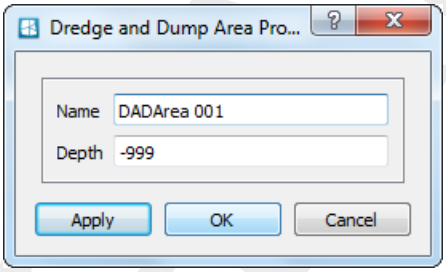

Figure 5.12: *Options on the* ***Dredge and Dump Properties*** *window for a dump area*

Delete area

Up on selecting *Edit →Dredge and Dump Areas →Delete Area* you can delete a polygon which defines a dredge or dump area. Click with the left mouse button inside a polygon, then that polygon will be deleted and all the links from or to that area.

Insert point

Upon selecting *Edit →Dredge and Dump Areas →Insert Point*, you can insert a point into the polygon. The point will be inserted at the closest linear piece of the polygon.

Move point

Upon selecting *Edit →Dredge and Dump Areas →Move Point*, you can move a point on the polygon.

Delete point

Upon selecting *Edit →Dredge and Dump Areas →Delete Point*, you can delete a point on the polygon by indicating it.

New link

Upon selecting *Edit* →*Dredge and Dump Areas* →*New Link*, you can define a link (connection) between a dredge and a dump area. First click in a dredge area, subsequently in the dump area.

Delete link

Upon selecting *Edit* →*Dredge and Dump Areas* →*Delete Link*, you can delete a link (connection) between a dredge and a dump area. After selecting the menu-item select with the left mouse button the link which need to be deleted.

5.3 Operations menu

On the *Operations* menu, see Figure 5.13, you may choose to calculate depth values at grid points from sample values using various interpolation options (grid cell averaging, triangular interpolation, internal diffusion). The area and volume of (part of) a grid can be calculated.

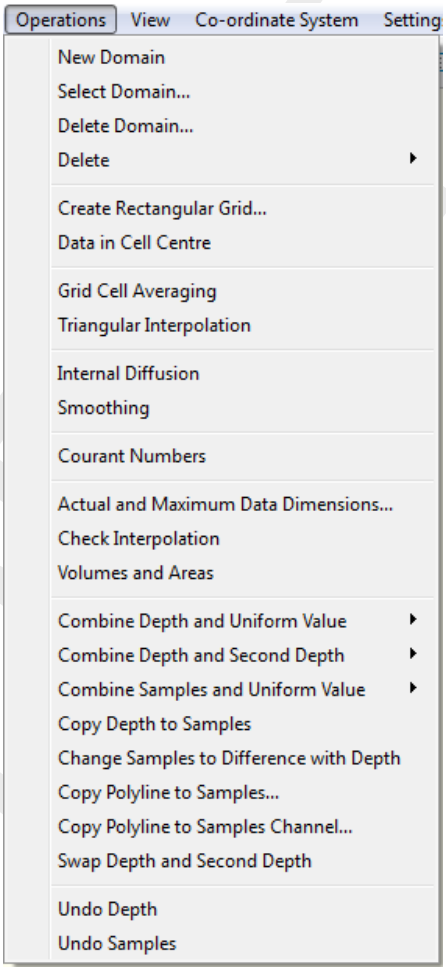

Figure 5.13: *Options on the* Operations *menu*

5.3.1 New Domain

On the *Operations* →*New Domain* menu, create a new domain. This means that every grid create action will add a new domain to your model. If you want to adjust your grid by the option *Operations* →*Create Rectangular Grid. . .*, deactivate this menu item first.

5.3.2 Select domain

If your project consists of multiple grids (so-called domain decomposition application) you can switch between the domains (grids) by clicking *Edit* →*Select Domain*, or click on the toolbar. Next, click on the grid you want to become the active grid.

5.3.3 Delete domain

To delete a domain or grid, select *Edit* →*Delete Domain*. Next, click on an active or inactive grid. When deleting a domain, also objects (except dredge and dump areas) defined on the grid will be deleted.

5.3.4 Delete

Using this option you can (see Figure 5.14) delete the Land Boundary, Polygons, Depth, Second Depth and Samples. It is possible to indicate an area of influence, by defining a polygon. If a polygon is defined, the operation applies to points inside the polygon. When choosing *Delete* →*Polygons* all polygons will be deleted.

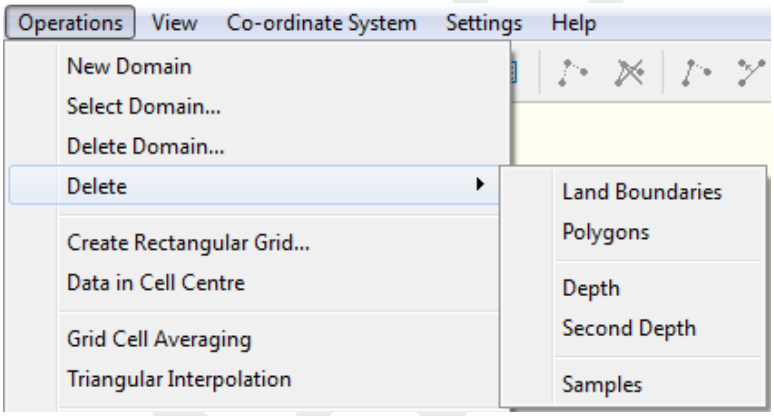

Figure 5.14: *Options on the* Operations →Delete *menu*

Land boundaries

If a polygon is defined, the land boundary points inside the polygon are removed. If no polygon exists you are asked if all land boundary points have to be removed. If you have defined two or more polygons, than only the points inside the first defined polygon will be removed.

Polygons

If polygons are present, they all will be removed.

Depth

If a polygon is defined, the depths inside the polygon are removed. If no polygon exists you are asked if all depth points have to be removed. If you have defined two or more polygons, than only the depths inside the first defined polygon will be removed.

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Second depth

If a polygon is defined, the second depths inside the polygon are removed. If no polygon exists you are asked if all second depth points have to be removed. If you have defined two or more polygons, than only the second depths inside the first defined polygon will be removed.

Samples

If a polygon is defined, the samples inside the polygon are removed. If no polygon exists you are asked if all samples have to be removed. If you have defined two or more polygons, than only the samples inside the first defined polygon will be removed.

5.3.5 Create Rectangular Grid

Specify the grid spacing, grid origin, rotation of the grid (counter clockwise) and the number of grid cells in both directions to quickly create a rectangular grid with rectangular cells. The parameters involved and their default values are, see Figure 5.15.

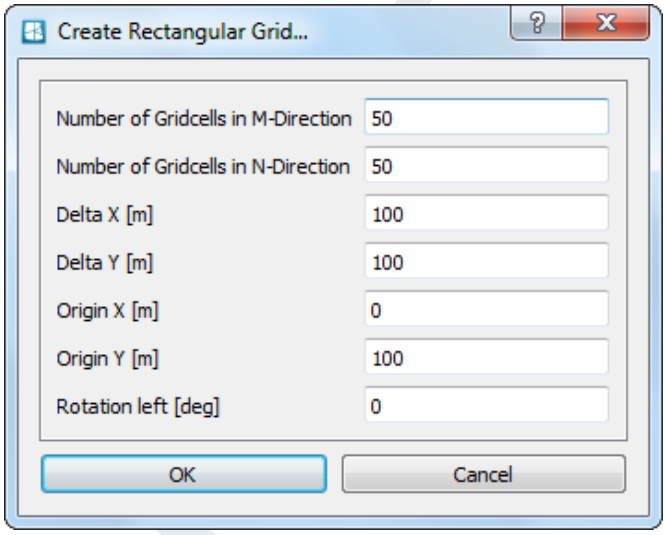

Figure 5.15: Create Rectangular Grid... *form*

- ◇ *Number of Grid Cells in M-Direction* default: 50
- ◇ *Number of Grid Cells in N-Direction* default: 50
- ◇ *Delta X [m]* default: 100.0
  Grid cell size M-direction [m]
- ◇ *Delta Y [m]* default: 100.0
  Grid cell size N-direction [m]
- ◇ *Origin X [m]* default: 0.0
- ◇ *Origin Y [m]* default: 100.0
- ◇ *Rotation left [degrees]* default: 0.0

5.3.6 Data in cell centre

QUICKIN can be applied to specify any spatially varying parameter, which may also be some initial condition or some spatially varying input parameter. Because some of these parameters may be defined at cell centres (rather than cell corners, as with Delft3D-FLOW depth values), the position of the points to interpolate (or average) to, can be changed to the cell centres. The water level is an example of a parameter defined at cell centres.

5.3.7 Grid cell averaging

This method is the preferred method if there are (many) more samples than grid points. The standard option is simple averaging. Also, the maximum or minimum value of the samples in the grid point vicinity can be chosen (maybe to guarantee a wetted gully), or the value of the closest sample within the vicinity. (See menu *Settings* →*Averaging Options*). The default vicinity is defined as the area covered by an 8 point polygon surrounding the current grid point, with its four corners as the cell centres of the four grid cells around the grid point. In between these corner points, another four points are added that lie halfway between the grid point and its neighbouring grid points. The default area can be increased or decreased in size by a linear scaling factor that can be specified in the *Settings* →*General* form.

Defaults:

- ◇ Relative Search Cell Size for Averaging: 1.0
- ◇ Minimum Number of Averaging Points: 4
- ◇ Averaging Options: Average value of near points

5.3.8 Triangular interpolation

The triangulation method is best suited for data sets that have a resolution that is about equal to or smaller than the grid resolution. The samples are first organised into a so-called Delaunay network, next grid values are interpolated. The amount of operations needed in the network creation process depends quadratically on the number of samples. So, consider working in portions rather than with the complete data sets. In that case, take special care at the border zones of adjacent interpolation areas. Maybe delete the border zones using a polygon and re-interpolate these zones using a slightly larger polygon.

Default:

- ◇ Default the ‘interpolation process’ is not shown, see the menu *View* →*Interpolation*

5.3.9 Internal diffusion

Grid points that have no depth value yet, i.e. ’blank’ points with the indicator value of -999, are modified in their value by the so-called ’Internal diffusion’ mechanism. Basically, this mechanism is a smoothing process which is called repeatedly, but that does not change values of already existing depth values. Therefore, a smooth transition with the existing bathymetry is inherent. This gives an easy method to fill ’gaps’ in a bathymetry, or to build new bathymetries in combination with the *Edit* →*Depth Linear* mode, as explained above. The *Number of Internal Diffusion Steps* can be specified in *General* form of menu *Settings*.

Default:

- ◇ Number of Internal Diffusion Steps default: 200

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5.3.10 Smoothing

In some bathymetries large depth gradients may occur, that may result in non-smooth numerical results in the hydrodynamic or wave programs. Isolate these regions and treat them with this volume conserving smoothing method.

The *Number of Smoothing Steps* and the *Smoothing Factor* can be specified in the *Settings* →*General* form.

The defaults are:

- ◇ Number of Smoothing Steps — default: 10
- ◇ Smoothing Factor — default: 0.5

5.3.11 Courant numbers

The latter option copies the Courant numbers defined as

$$Courant = 2\Delta T c \sqrt{1/\Delta x^2 + 1/\Delta y^2}$$

see Delft3D-FLOW (2013), to the second depth array and sets display parameters such that the second depth is displayed as continuous shading. Δt is the computational time-step in seconds (see *Settings* →*General*), and c the local wave celerity, $\sqrt{g(h+\zeta_0)}$ (see menu item *Settings* →*General*).

The default values are:

- ◇ Time-step for Courant Number — default: 60.0 [s]
- ◇ Reference Level ζ_0 — default: 0.0 [m]

Remark:

- ◇ Note that you have to specify the time-step in seconds, but in FLOW you specify minutes.

5.3.12 Actual and maximum data dimensions

The actual and maximum dimensions of various data objects are presented in ‘history’.

5.3.13 Check interpolation

If both samples and depth values are opened in the program, it is possible to check the quality of the interpolation by reverse interpolation of the samples in the created bathymetry. The reverse interpolation is performed for all grid cells within the polygon that have depth values at all four grid cell-corners. The reverse-interpolation is realised by bilinear interpolation of the samples in the grid cells. The difference between these values and the original sample values gives an indication for the quality of the interpolation. (Or an indication of the variance of your sample data in relation to the resolution of the grid. Therefore, if you see large differences, do not conclude too hastily that the interpolation itself is poor!) The mean difference, the mean absolute difference and the maximum difference are presented via menu option *Operations* →*Actual and maximum data dimensions*, together with the number of samples that have been evaluated.

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5.3.14 Volumes and areas

Volumes and areas are calculated for computational grid cells within the polygon. The area of the computational cells is always smaller then the area of the polygon. If no polygon is given, all grid cells are used. The volumes and areas are computed for those cells with four valid depth values (data at cell vertices) or with one valid depth value (data at cell centre). Also the depth should be positive ($\zeta_{\text{ref}} + d^{\zeta} > 0$) for a contribution to the volumes and areas. Where d^{ζ} is the depth value at the cell centre, for data defined at the cell vertices it is defined as mean value of the four surrounding depth values.

Areas are given in the squared unit of the grid (mostly given in metres); volumes are given in squared unit of the grid multiplied by the unit of the depth. (For a Delft3D-FLOW bathymetry, both must be in metres). Volumes are given below a user definable reference level. The origin of that reference level is equal to the reference level of the depth data. The reference level is defined positive in upward direction. (Whereas depth values are defined positive in downward direction.)

Default:

◇ Reference Level ζ_{ref} default: 0.0 [m]

Several reference levels

To compute the volumes and areas for a lot of reference levels you can specify the file <reference_levels.txt>. The file format is:

File contents	Reference levels to compute volumes and areas
Filetype	ASCII
File format	Free formatted
Filename	<reference_levels.txt>
Generated	Manually

Record description:

Record	Record description
1	Number of reference levels (one integer)
2–end	Reference level (reals). The reference level is defined positive upward.

Example

```
11
10.
8.
6.
4.
2.
0.
-5.
-10.
-15.
-20.
-25.
```

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Remark:

- ◇ If you want to specify an other value than given in the <reference_levels.txt> file. You have to specify this value in the file or rename the file, so it will not be recognized by QUICKIN and the window will appear

5.3.15 Combine depth and uniform value

Using this option you can (see Figure 5.16) assign a value to not yet specified depths. For existing depths you can do some basic operations: add a constant value (for instance when you want to change the reference level), multiply with a constant value (for instance with -1 when your depths are positive upwards), or take the minimum or maximum of the depths and a specified value. Optionally, you can use a polygon to restrict the area of operation.

To use this options you first have to specify the uniform value (default: -999.0) in a pop-up window.

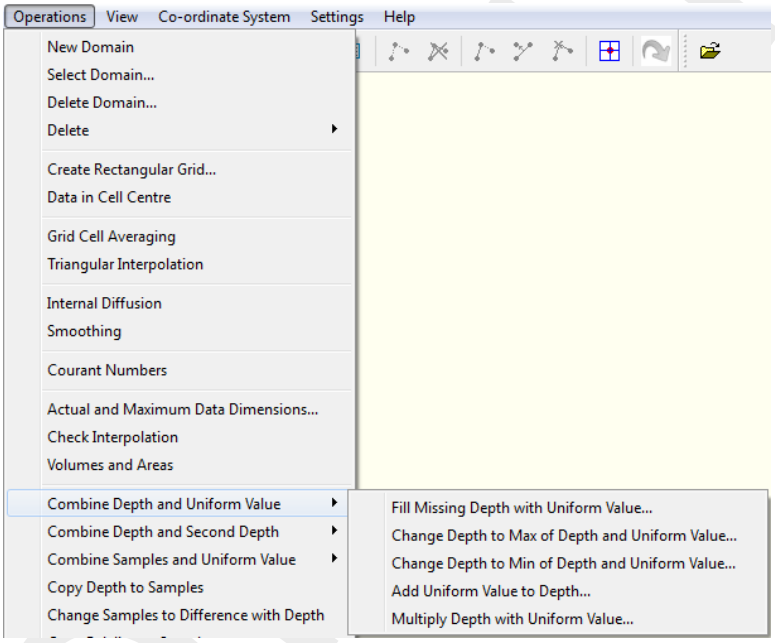

Figure 5.16: *Options on the* Combine Depth and Uniform Value *sub-menu*

Fill Missing Depths with Uniform Value

This option operates on grid points with non-existing depth values; they will be assigned the *Uniform Value*. The other options operate on grid points with existing (yet defined) depth values.

Change Depth to Max of Depth and Uniform Value

If the *Uniform Value* is larger than the depth, the depth value is replaced by the *Uniform Value*.

Change Depth to Min of Depth and Uniform Value

If the *Uniform Value* is smaller than the depth, the depth value is replaced by the *Uniform Value*.

Add Uniform Value to Depth

The *Uniform Value* is added to the depth value.

Multiply Depth with Uniform Value

The depth value is multiplied by the *Uniform Value* (for instance with -1 when your depths are positive upwards).

5.3.16 Combine depth and second depth

Using this option you can (see Figure 5.17) manipulate the depth using the second depth. The depth can be replaced by the second depth, the maximum or minimum can be taken, the second depth can be added or subtracted, the depth can be multiplied or divided by the second depth. If a polygon is defined, the operation applies to grid points inside the polygon.

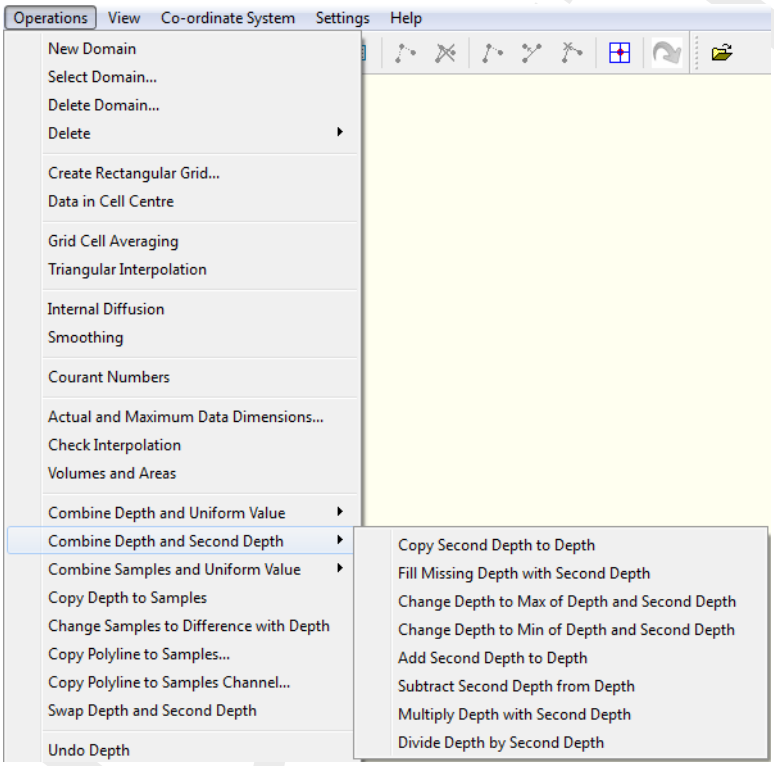

Figure 5.17: *Options on the* Combine Depth and Second Depth *sub-menu*

Copy Second Depth to Depth

If the second depth value is specified, the depth value will be replaced by the second depth value.

Fill Missing Depth with Second Depth

This option operates on grid points with non-existing depth values; they will be assigned the *Second Depth Value*.

Change Depth to Max of Depth and Second Depth

If the *Second Depth Value* is larger than the depth, the depth value is replaced by the *Second Depth Value*.

Change Depth to Min of Depth and Second Depth

If the *Second Depth Value* is smaller than the depth, the depth value is replaced by the *Second Depth Value*.

Add Second Depth to Depth

The *Second Depth Value* is added to the depth value.

Subtract Second Depth from Depth

The *Second Depth Value* is subtracted from the depth value.

Multiply Depth with Second Depth

The depth value is multiplied by the *Second Depth Value*.

Divide Depth by Second Depth

The depth value is divided by the *Second Depth Value*.

5.3.17 Combine samples and uniform value

Using this option you can (see Figure 5.18) manipulate samples compared to a *Uniform Value*. Optionally, you can use a polygon to restrict the area of operation.

To use these options you first have to specify the uniform sample value.

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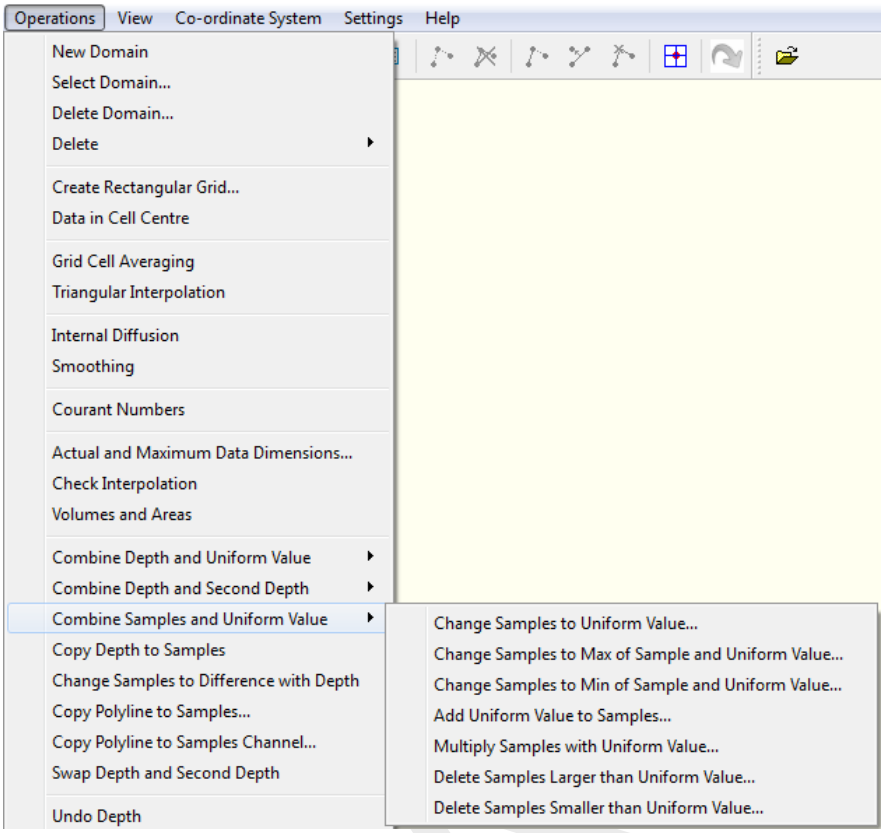

Figure 5.18: *Options on the* Combine Samples and Uniform Value *sub-menu*

Change Samples to Uniform Value

Samples will get the *Uniform Value*.

Change Samples to Max of Sample and Uniform Value

Samples with a value smaller than the *Uniform Value* will get the *Uniform Value*.

Change Samples to Min of Sample and Uniform Value

Samples with a value larger than the *Uniform Value* will get the *Uniform Value*.

Add Uniform Value to Samples

The *Uniform Value* will be added to the sample value.

Multiply Samples with Uniform Value

Samples will be multiplied by the *Uniform Value.*

Delete Samples Larger than Uniform Value

Samples larger than the *Uniform Value* will be deleted.

Delete Samples Smaller than Uniform Value

Samples smaller than the *Uniform Value* will be deleted.

5.3.18 Copy depth to samples

If you want to interpolate a detailed model based upon an existing overall model, first open the grid and the depths of the overall model. Then, copy the overall depth information to the samples and open the detailed model grid. Then, interpolate these samples to the detailed model. If a polygon is defined, the depth points inside the polygon are copied to samples.

5.3.19 Change samples to difference with depth

The depth value at sample point locations is interpolated based upon the depth values at the grid points. Next the original sample value is subtracted from this re-interpolated value.

5.3.20 Copy polyline to samples

A polyline can be changed to sample points by specifying the value at the begin and end of the polyline, see Figure 5.19. By linear interpolation the samples in-between are determined. If 'NO' linear interpolation is specified (0) the value at the begin of the polyline is used for all samples on the polyline (iso-line). The number of samples per line segment can be specified in the *Settings →Polyline to Samples* window, see Figure 5.19. Also, spline shape is possible for smooth isolines.

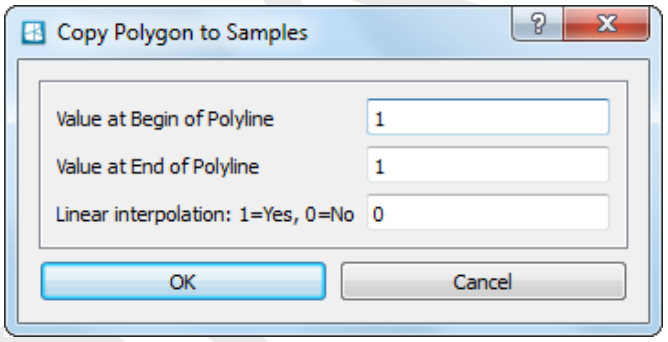

Figure 5.19: *Copy Polyline to Samples parameters*

The default values are:

- ◇ Value at Begin of Polyline — default: 1.0 [m]
  If no linear interpolation is used, all points will have the value at the begin.
- ◇ Value at End of Polyline — default: 0.0 [m]
- ◇ Linear Interpolation Yes or No — default: 0 (No)

Remark:

- ◇ If you define more than one polygon, only the first polygon will be used.

5.3.21 Copy polyline to samples channel

A polyline can be changed to sample points of a channel where the polyline is the centre line of the channel. The depth and width at the bottom have to be specified at the beginning and end of the channel as well as the channel slope and the number of samples across the channel width, see Figure 5.20. If the channel is placed in an existing bottom (presented

by samples) it is possible to remove channel samples above the original bottom and remove existing samples above the channel (dredged channel). To this end a triangle network is created by the program. The position where a line of the channel slope crosses a triangle, a sample is created with a depth which is determined by linear interpolation of the depth of the triangle edges. The number of samples and the shape of the channel line can be specified in the *Settings* menu, *Polyline to Samples* window, see Figure 5.20

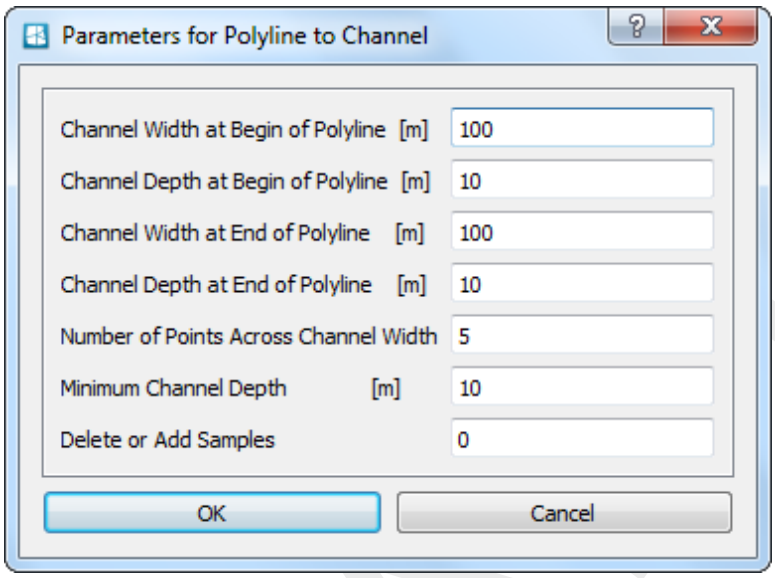

Figure 5.20: *Parameters form for Polyline to Samples Channel*

The default values are:

- ◇ Channel Width at Begin of Polyline — default: 100.0 [m]
- ◇ Channel Depth at Begin of Polyline — default: 10.0 [m]
- ◇ Channel Width at End of Polyline — default: 100.0 [m]
- ◇ Channel Depth at End of Polyline — default: 10.0 [m]
- ◇ Number of Points across Channel Width — default: 5
- ◇ Channel Side Slope — default: 5
- ◇ Minimal Channel Depth — default: 10.0 [m]
- ◇ Delete or Add Samples — default: 0

Remark:

- ◇ If you define more than one polygon, only the first polygon will be used.

5.3.22 Swap depth and second depth

This will interchange the depth and second depth points. If a polygon is defined, only the depth points inside the polygon are interchanged.

5.3.23 Undo depth

Reset the depth values to values prior to the last action. When applying the edit modes, pressing `Esc` has the same effect.

5.3.24 Undo samples

Reset the sample values to values prior to the last action. When applying the edit modes, pressing Esc has the same effect.

5.4 View menu

On the *View* menu, you may choose to display several data sets, see Figure 5.21

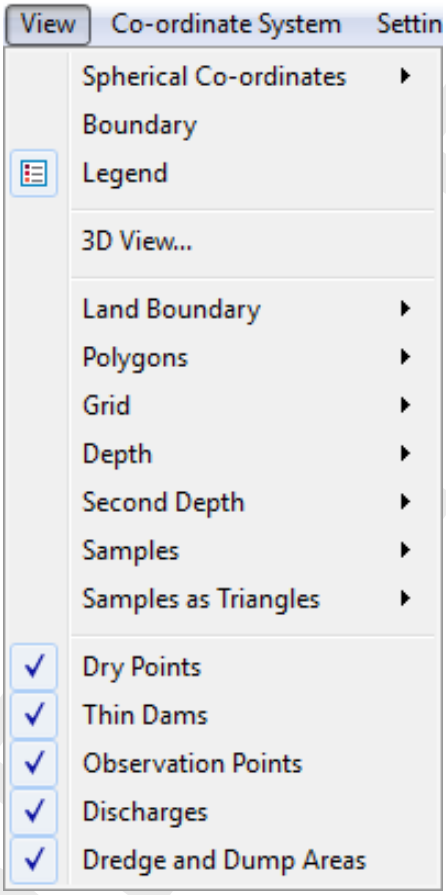

Figure 5.21: *Options on the* View *menu*

5.4.1 Spherical co-ordinates

Here you can select how to project the spherical co-ordinates onto the screen, see Figure 5.22.

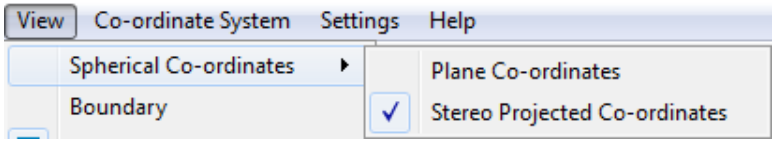

Figure 5.22: *Options on the* View →Spherical Co-ordinates *sub-menu*

Remarks:

- ◇ Only applicable for a spherical co-ordinate system.
- ◇ Default: A spherical grid is shown in stereographic projected co-ordinates.

Plane co-ordinates

Upon selecting *View* →*Spherical Co-ordinates* →*Plane Co-ordinates*, you can choose to the display the co-ordinates as they are.

Stereographic projected co-ordinates

Upon selecting *View* →*Spherical Co-ordinates* →*Stereo Projected Co-ordinates*, the co-ordinates are displayed using a stereographic projection onto the screen.

5.4.2 Boundary

Show or hide the computational boudary.

5.4.3 Legend

Show or hide the colour band on the left side of the screen.

5.4.4 3D View

Does not have the required performance, it very slow

In the **Delft3D-3DView** window a fully 3-dimensional view of the data is shown.

`c`: Switch rendering mode
`h`: Toggle help
`i`: Inverse depth
`r`: Reste view
`s`: Toggle samples
`x`: Increase depth
`z`: Decrease depth
left mouse: Rotate in xy-plane
`CTRL`+left mouse: move origin xy-plane
middle-mouse: zoom
right mouse: rotate z-axis

5.4.5 Land boundary

Upon selecting *View* →*Land Boundary*, you can show the land boundary.

The following view options are available:

- ◇ *No Land Boundary*
  Do not show the land boundaries.
- ◇ *Lines*
  Show the land boundaries as lines.
- ◇ *Lines with Dots*
  Show the land boundaries as lines with dots at the land boundary points.
- ◇ *Filled*
  Show the land boundaries as lines filled with a colour.

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5.4.6 Polygons

The following view options are available:

- *No Polygons*
  Do not show the polygons.
- *Lines*
  Show the polygons as lines.
- *Lines with Dots*
  Show the polygons as lines with dots at the polygon points.
- *Filled*
  Show the polygons as lines filled with a colour.

5.4.7 Grid

The following view options are available:

- *No grid*
  Do not show the grid.
- *Lines*
  Show the grid with lines.
- *Node numbers*
  Show the node numbers.
- *Cell numbers*
  Show the grid cell numbers.

5.4.8 Depth

The following view options are available:

- *No depth*
  Do not show the depth.
- *Continuous shades*
  Show the depth as continuous shades interpolated from the values at the depth points.
- *Patches*
  Show the depth as average of the depth points.
- *Coloured Dots*
  Show the depth as coloured dots.
- *Coloured Numbers*
  Show depth with numbers coloured according value.
- *Mono coloured Numbers*
  Show depth with numbers in a single colour.
- *Points yet to be found*
  Show the depth points with an undefined value.

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5.4.9 Second depth

The following view options are available:

- ◇ *No second depth*
  Do not show the second depth.
- ◇ *Continuous shades*
  Show the second depth as continuous shades interpolated from the values at the depth points.
- ◇ *Patches*
  Show the second depth as average of the values at the depth points.
- ◇ *Coloured Dots*
  Show the second depth as coloured dots.
- ◇ *Coloured Numbers*
  Show second depth with numbers coloured according value.
- ◇ *Mono coloured Numbers*
  Show second depth with numbers in a single colour.
- ◇ *Points yet to be found*
  Show the second depth points with an undefined value.

5.4.10 Samples

The following view options are available:

- ◇ *No Samples*
  Do not show the samples.
- ◇ *Coloured Dots*
  Show the samples as coloured dots.
- ◇ *Coloured Numbers*
  Show samples with numbers coloured according value.
- ◇ *Mono coloured Numbers*
  Show samples with numbers in a single colour.

5.4.11 Samples as triangles

The samples can be displayed as colour filled isolines using a triangle network. This is a slow visualisation method, zoom in to reduce the number of samples that must be triangulated. It is possible to display the slopes (α) of the individual triangles, or the local mild slope criterion. The slope is defined as the inner product of the triangle normal vector and the upward unit vector. The mild slope criterion is defined as α/kH, H being the total water depth, $(d + \zeta_0)$ and k being the wave number, which depends on the specified *Wave Period*. You can either display these values as numbers, or as green/red triangles indicating whether the slope or mild slope criterion is satisfied.

The following display options are available:

- ◇ *No Sample Triangles*
- ◇ *Edges*
- ◇ *Continuous Shading*
- ◇ *Edges and Continuous Shading*
- ◇ *Triangle Slopes*
  This option triggers the following sub-menu, see Figure 5.23

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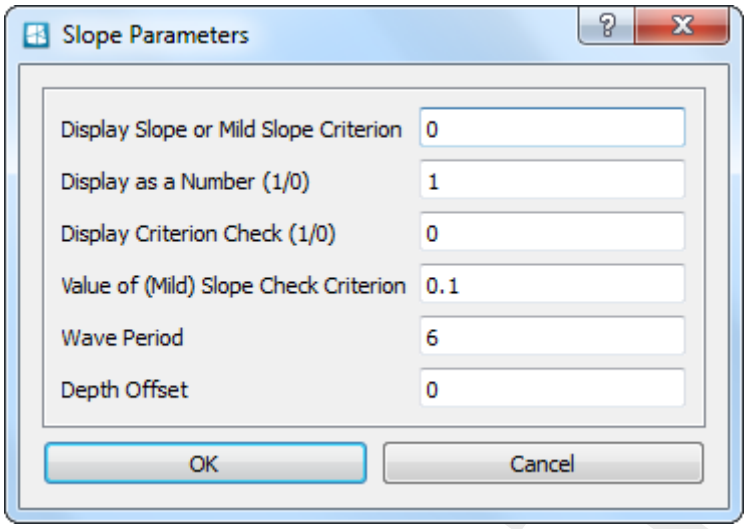

Figure 5.23: *Options on the* ***Slope Parameters*** *window*

- ◇ *Display Slope or Mild Slope Criterion* default: neither
  For each triangle, either the slope or the mild slope criterion can be displayed or be checked against some criterion.
- ◇ *Display as a Number Yes/No* default: yes
- ◇ *Display Criterion Check Yes/No* default: no
  Shows in red/green whether the slope or mild slope criterion is satisfied
- ◇ *Value of (Mild) Slope Check Criterion* default: 0.1
  If a criterion check is requested, then its value can be specified here.
- ◇ *Wave Period* default: 6.0 [s]
  Needs only be specified if mild slope criterion is required
- ◇ *Depth Offset* default: 0.0 [m]
  Is used in wave period computation, added to local depth.

5.4.12 Dry points

Show or hide the dry points.

5.4.13 Thin dams

Show or hide the thin dams.

5.4.14 Observation points

Show or hide the observation points.

5.4.15 Discharges

Show or hide the discharge locations.

5.4.16 Dredge and dump areas

Show or hide the dredge and dump areas.

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5.5 Co-ordinate System menu

If you want to import some files and you known on forehand what the co-ordinate system is you have to select it here. Sometimes this will be the case if you first load a land boundary and/or polygons before you import the grid.

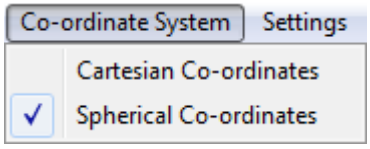

Figure 5.24: *Options on* Co-ordinate System *menu*

There are two option for the co-orduinate system

1 *Cartesian co-ordinates*.
2 *Spherical co-ordinates*
Only WGS84 is supported.

5.6 Settings menu

The following options can be accessed through the *Settings* menu, see Figure 5.25

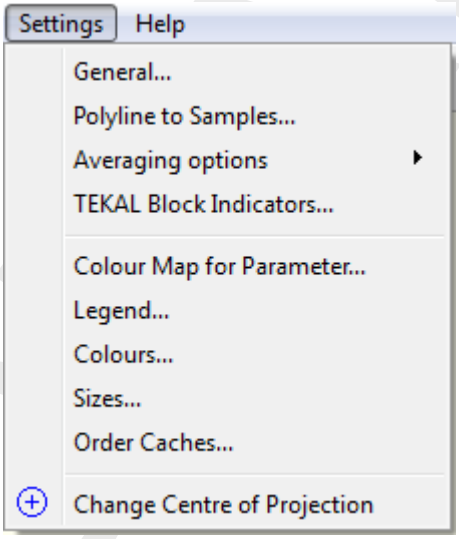

Figure 5.25: *Options on* Settings *menu*

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5.6.1 General

The following parameters influence the behaviour of the operations above. They are set via the following parameter list, see Figure 5.26

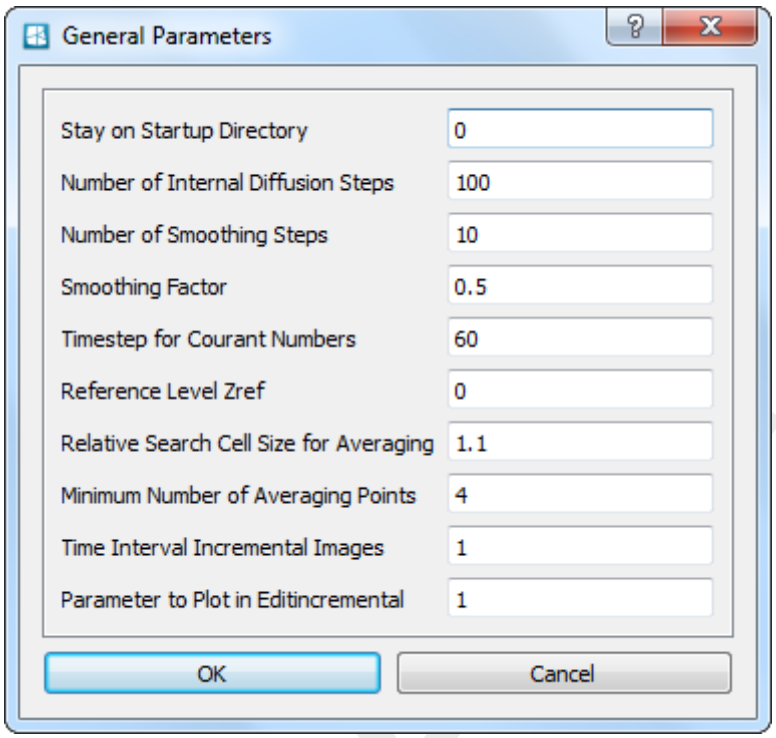

Figure 5.26: *Options on* ***Settings*** *window*

- ◇ *Go Back to Start-up Directory Yes or No* default: 0 (No)
  When navigating through the directories in the file menu, you can specify whether to always go back to the start up directory, or keep the latest directory so that you have to navigate only once.
- ◇ *Number of Internal Diffusion Steps* default: 200
- ◇ *Number of Smoothing Steps* default: 10
- ◇ *Smoothing Factor* default: 0.05
  A value of 0.0 gives no smoothing; a value of 1.0 makes a point the average of its neighbouring depth points.
- ◇ *Time-step for Courant Number* default: 60.0 [s]
  The time step is in seconds. The Courant number is computed following the definition in the Delft3D-FLOW User Manual, valid for the ADI method in a staggered grid. The local water depth is the depth value + the Reference Level ζ_0
- ◇ *Reference Level Zref* ζ_0 default: 0.0 [m]
  The reference level is defined as positive upward.
- ◇ *Relative Search Cell Size for Averaging* default: 1.1
  Giving a cell search area of 1 grid cell, a value of two gives a factor 2 larger cells in both directions.
- ◇ *Minimum Number of Averaging Points* default: 4
- ◇ *Time Interval Incremental Images* default: 0.05
- ◇ *Parameter to Plot in Edit-incremental* default: 1
  1 = water height, 2 = flow velocity, 3 = water level, 4 = U-component, 5 = V-component
- ◇ *Delete Polygon after Operations* default: 0 (No)

5.6.2 Polyline to samples

In the parameter form, see Figure 5.27, you can specify the number of samples per polyline segment, the distance between the samples, and the shape of the polyline.

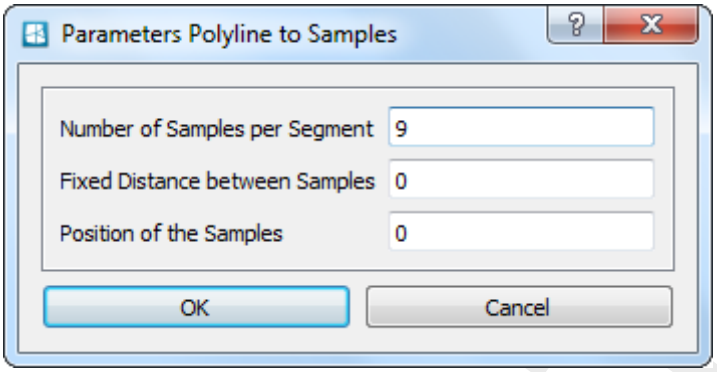

Figure 5.27: *Options on* ***Parameters Polyline to Sample*** *window*

- ◇ *Number of Samples per Segment* default: 9
- ◇ *Fixed Distance between Samples* default: 0.0 [m]
  A non-zero distance specifies the distance between the samples. If zero distance is specified, the distance depends on the segment size and the number of points per segment.
- ◇ *Spline Shape Yes or No* default: 0 (No)
  The shape of the *Polyline to Samples* and *Polyline to Samples Channel* operations can be a straight line (0) or a spline shape (1).

5.6.3 Averaging options

For all averaging methods, see Figure 5.28, the surrounding area depends on the shape of the surrounding grid cells and the parameter *Relative Search Cell Size for Averaging* (in *Settings* $\rightarrow$*General*). The default value of 1.0 gives an area of 1.0 grid cell, a value of two gives a factor 2.0 larger cells in both directions. The shape of the area around a given grid point is defined by an eight point polygon that has the surrounding cell centres as corners and the points halfway in between the grid point and the surrounding grid points in between these corners.

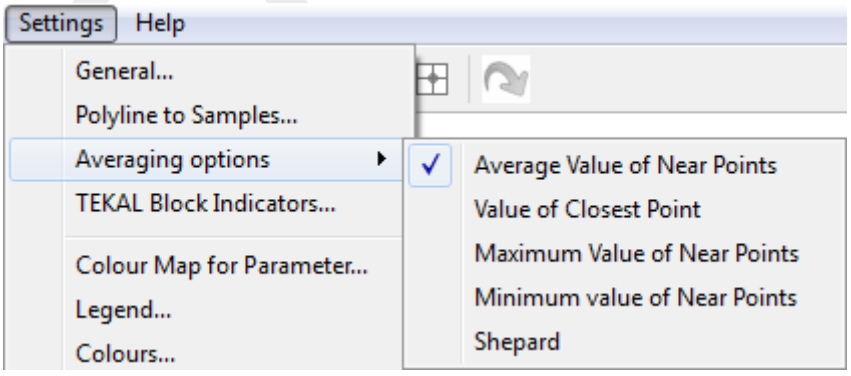

Figure 5.28: *Options on* Averaging Options *menu*

- ◇ *Average Value of Near Points*
- ◇ *Value of Closest Point*
- ◇ *Maximum Value of Near Points*
- ◇ *Minimum Value of Near Points*

◇ *Shepard*
The Shepard method is a weighted averaging method, with weights depending on the reciprocal of the squared distance between the grid point and the surrounding samples:

$$\overline{s} = \frac{\sum_{i=1}^{N} \frac{s_i}{d_i^2}}{\sum_{i=1}^{N} \frac{1}{d_i^2}} \tag{5.1}$$

with:

$\overline{s}$	Averaged value
N	number of samples within the polygon
d_i	distance between grid point and sample point i
s_i	value of sample point i

5.6.4 TEKAL block indicators

The next parameters (see Figure 5.29) can be specified to indicate which block of x, y and z values must be read from a TEKAL type file.

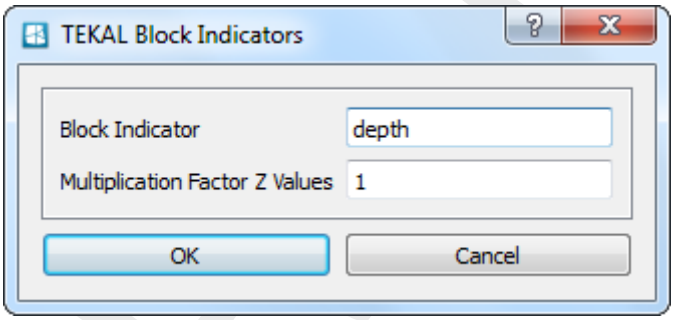

Figure 5.29: *Options on* ***TEKAL Block Indicator*** *window*

◇ *Block Indicator*, (4 Characters) default: dept
◇ *Multiplication Factor for z Values* default: 1.0

5.6.5 Change colour map

When clicking on the *Settings →Colour Map for Parameter* menu, a form opens in which you can select the relation between a parameter (i.e. Depth) and the loaded colour maps; see Figure 5.30

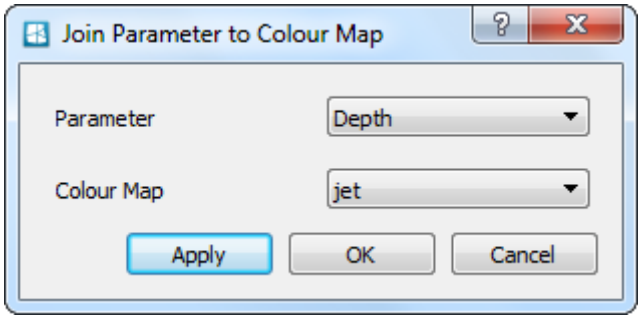

Figure 5.30: *Opions on* ***Colour Map for Parameter*** *window*

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5.6.6 Legend

When clicking on the *Settings* →*Legend* menu, a form opens in which you can define how the iso-colour figures should be displayed; see Figure 5.31

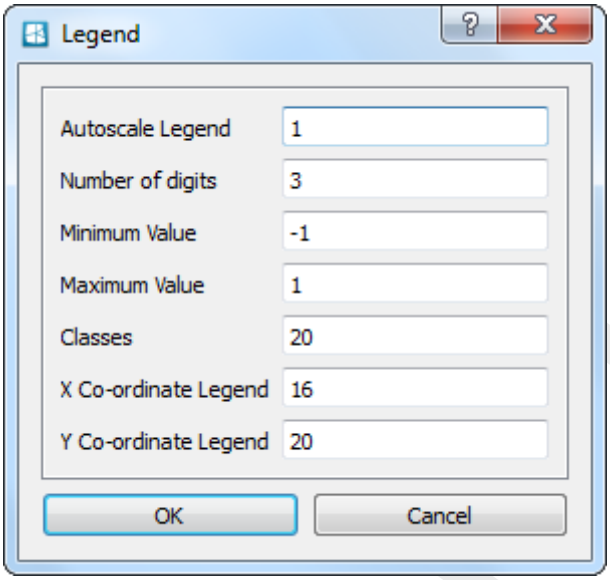

Figure 5.31: *Opions on* Settings →Colours *menu*

- ◇ *Autoscale Legend* default: On
  Specify whether the program should determine the isocolour values automatically, or to do it yourself. If you leave it to the program, it will determine the minimum and maximum depth value within the viewing area and display the number of iso-colours specified above. Zooming in will always result in display of the same number of iso-colours. If you want to specify the isocolour values yourself, you have to specify one of the three parameters below. When zooming in, the iso-colour values will remain fixed.
- ◇ *Number of digits* default: 3
  Specifying the number of digits used in the legend and on the map.
- ◇ *Minimum Value* default: On
  Specifying this value turns autoscale off.
- ◇ *Maximum Value* default: On
  Specifying this value turns autoscale off.
- ◇ *Classes* default: 20
  The number of classes can be specified
- ◇ *X Co-ordinate Legend* default: 16
  x Co-ordinate of lower left corner of legend in pixels
- ◇ *Y Co-ordinate Legend* default: 20
  y Co-ordinate of lower left corner of legend in pixels

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5.6.7 Colours

When clicking on the *Settings* →*Colours* menu, a form opens in which you can define the colours for background, land boundary, polygons, etc.; see Figure 5.32

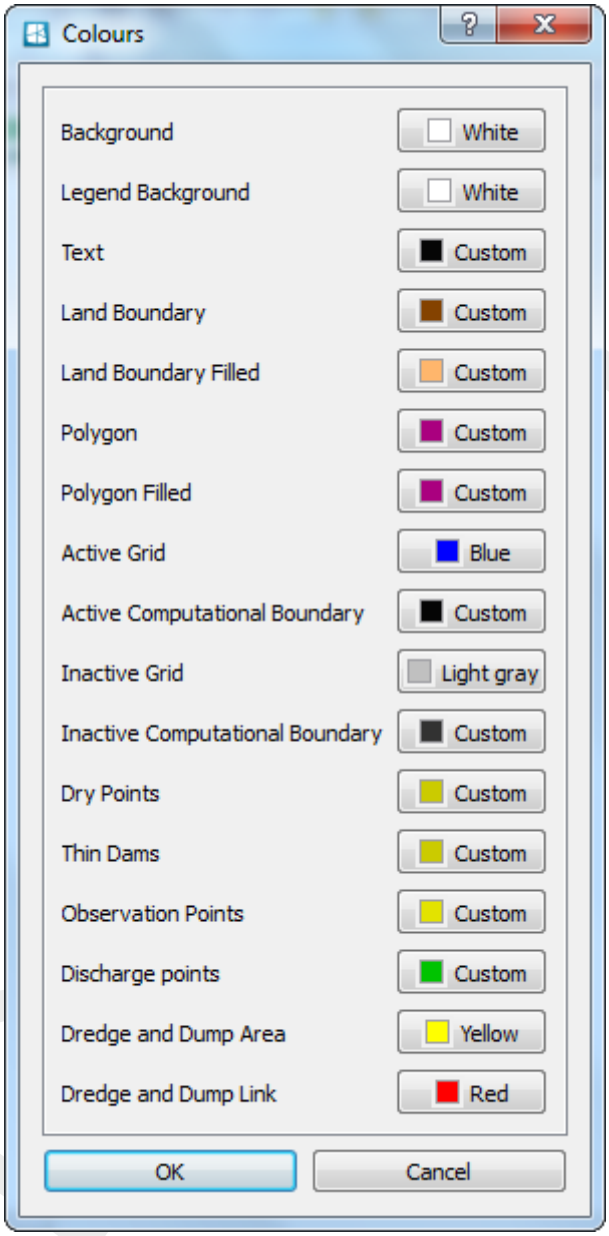

Figure 5.32: *Opions on* Settings →Colours *menu*

5.6.8 Sizes

When clicking on the *Settings* →*Sizes* menu, a form opens in which you can define the linewidth and dotsize in pixels. See Figure 5.33

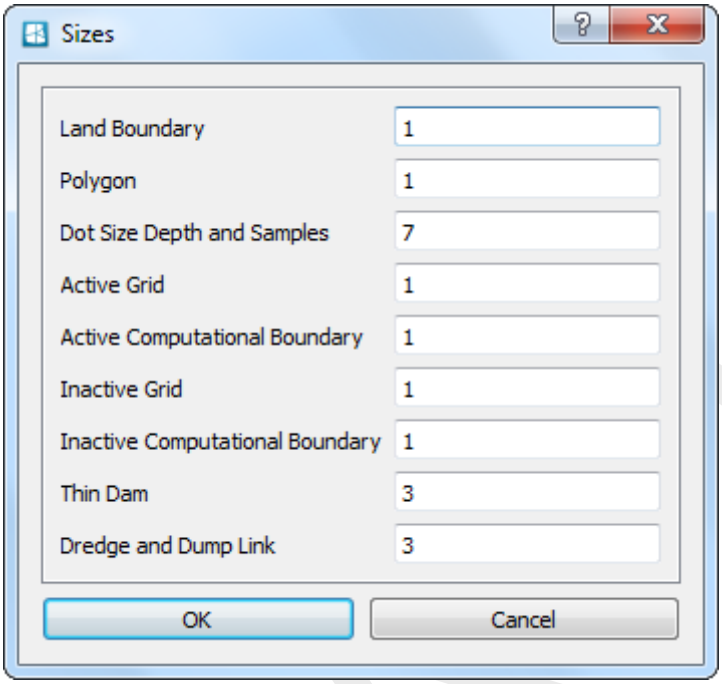

Figure 5.33: *Opions on* Settings →Sizes *menu*

5.6.9 Order caches

The parameters set in the **Order caches** window, see Figure 5.34, influence the drawing order of the several items. The drawing order of the caches is: $5, 4, 3, 2, 1, 0$. Cache 5 is drawn first and cache 0 is drawn last. So the items which will drawn in cache 0 are drawn on top. If there is no need the draw a cache it will not be done, this improves the drawing performance by avoiding unnecessary drawing. So if an item is changed in cache 3 only caches $3, 2, 1$ and 0 are drawn.

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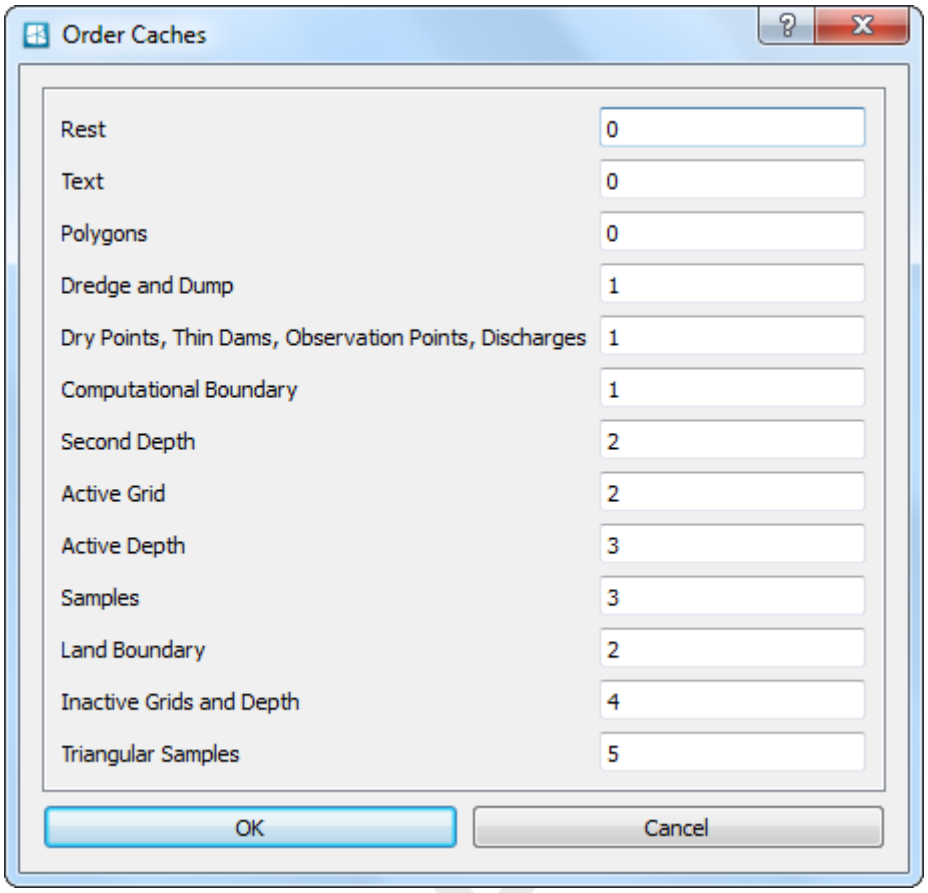

Figure 5.34: *Options on* ***Order Caches*** *window*

- ◇ Rest default: 0
- ◇ text default: 0
- ◇ Polygons default: 1
- ◇ Dredge and Dump default: 1
- ◇ Dry Points, Thin Dams, Observation Points default: 1
- ◇ Computational boundary default: 1
- ◇ Second Depth default: 1
- ◇ Active Grid default: 2
- ◇ Active Depth default: 2
- ◇ Samples default: 2
- ◇ Land Boundary default: 1
- ◇ Inactive Grids and Depths default: 4
- ◇ Triangle Samples default: 5

5.6.10 Change centre of projection

For spherical co-ordinates QUICKIN can use two different projections, plane projection and stereographic projection. For stereographic projection a special function is implemented to centring the computer screen to the centre of projection and the sphere. This function can be invoked by clicking the menu item *Operations* →*Change Centre of Projection*, see Figure 5.13. When using this command the centre of the projection is set to the centre of the screen. This action requires recalculation of the projection and a new screen refresh. The centre of the projection does not change when using zoom in, zoom out or pan, so there is no performance drawback and a smooth screen-refresh is obtained.

5.7 Help menu

On the *Help* menu, you may choose to read the user manual or the version number of QUICKIN; see Figure 5.35

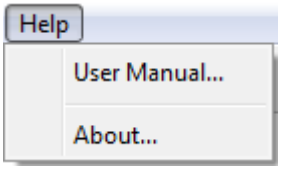

Figure 5.35: *Opions on* Help *menu*

5.7.1 User manual

When clicking on the *Help* →*User Manual* the user manual of QUICKIN will be displayed (file <QUICKIN _User_manual.pdf>), see Figure 5.36.

5.7.2 About

When clicking on the *Help* →*About* a window will display the current version number of QUICKIN.

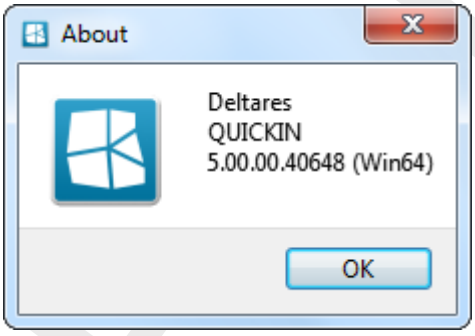

Figure 5.37: *About box*

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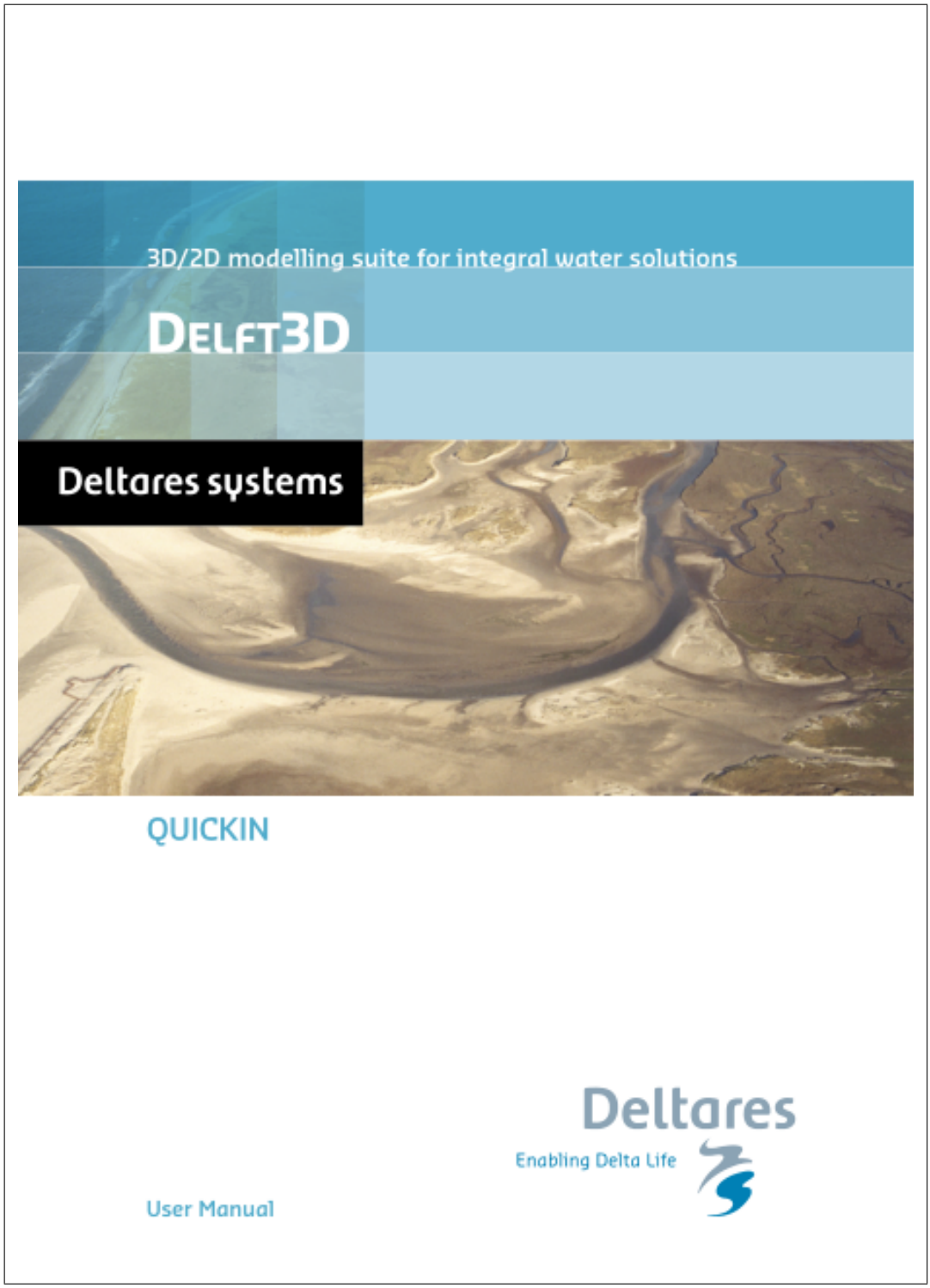

Figure 5.36: *Front page of the manual*

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6 Tutorial

6.1 Interpolation

6.1.1 Open grid and land boundary

For details, see Sections 3.2 and 3.3

- ◇ Start Delft3D and click *Select working directory* to enter the <tutorial\quickin\maracaibo> directory.
- ◇ Start QUICKIN.

For Lake Maracaibo we will exercise generating a bathymetry from samples for Delft3D-FLOW.

- ◇ On the *File* menu, select *Attribute Files* and click *Open Land Boundary...*.
- ◇ Select and open the file <mar_01.ldb> that contains an outline of the land boundary.
- ◇ On the *File* menu, select *Import* and click *Grid (RGFGRID)...*; open <mar_02.grd>

The land boundary and grid look like in Figure 6.1.

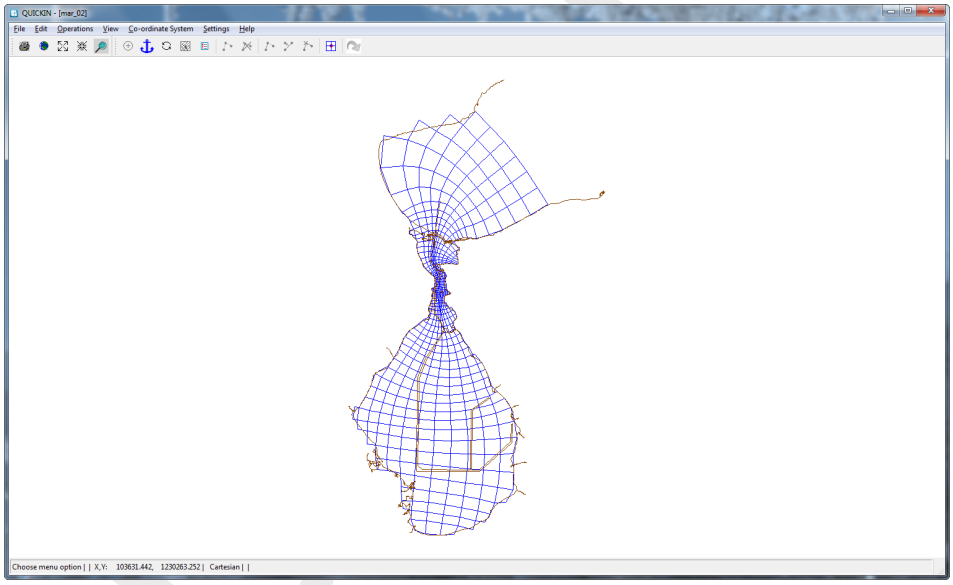
QUICKIN - [mar_02]
File Edit Operations View Co-ordinate System Settings Help
Choose menu option | | X,Y: 103631.442, 1230263.252 | Cartesian | |

Figure 6.1: *Land boundary and grid for Lake Maracaibo*

In Delft3D-FLOW, the water level is defined in the centre of a grid cell that is surrounded by four grid points. In the next steps, the model bathymetry at the grid points will be created by interpolating the available depth samples.

6.1.2 Open samples

- ◇ On the *File* menu, select *Attribute Files* and click *Open Samples...*.
- ◇ Open the scattered samples file <mar_02.xyz>.

Note: that the sample density is high in the centre part and low in the lower part. In low sample density areas, triangulation is more suited, in high density areas, averaging is more suited, see Figure 6.2.

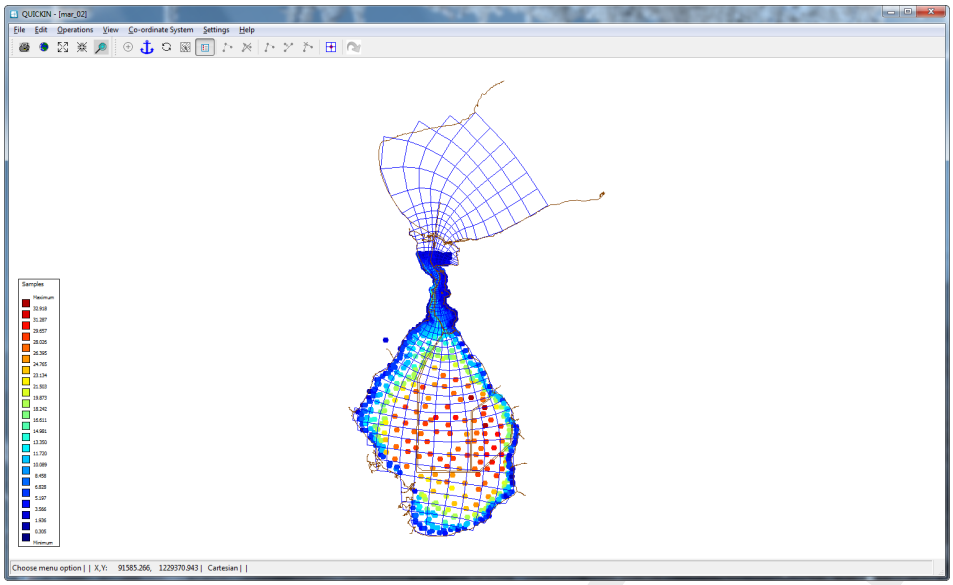

Figure 6.2: *Samples covering the Lake Maracaibo model area*

6.1.3 Zoom in and out

To zoom in or out several facilities are available:

- ◇ On the toolbar click to zoom in or to zoom out.
- ◇ Press the + or - key while keeping the CTRL-key pressed.
- ◇ Use the mouse scroll wheel.

To zoom in on a specific area

- ◇ Click on the toolbar and drag a box around the area.
- ◇ To zoom out to full extent, click on the toolbar.

To pane the grid: keep the CTRL-key pressed and move around with the cursor. Hereafter you will interpolate the sample data onto the grid.

6.1.4 High and low sample density

Areas with a high sample density need an other interpolation method then areas with a low sample density. In general grid cell averaging is used in areas with a high sample density, and triangulation is used in areas with a low sample density. High sample density is obtained where there are a few or more sample points in the direct neighbourhood of a grid point, low density is obtained when there is in average less then 1 sample point in the direct neighbourhood.

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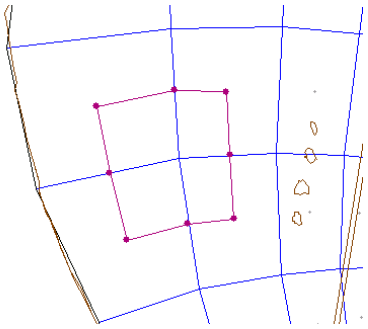

Figure 6.3: *Default relative search cell for grid cell averaging*

High sample density

The dense part is best interpolated by an averaging procedure, so that all samples within the direct surroundings of a grid point (see Figure 6.3) are taken into account to get the best volume for the grid cell.

The default relative search area is defined by the centres of the surrounding grid cells, and the mids of the grid cell faces, see Figure 6.3. The minimum number of samples for grid cell averaging is default 4. If there are less samples in the search area, no depth value is calculated. Moreover, if there are not enough samples available, the depth should be interpolated by triangulation. The relative search area and minimum number of averaging points can be changed in *Settings* → *General*.

- ◇ Create a polygon by clicking on the toolbar and next by clicking the left mouse around the interpolation area, see Figure 6.4.
- ◇ Click the right-mouse button to close the polygon and leave the polygon edit mode.
- ◇ On the *Operations* menu, click *Grid Cell Averaging* to perform the averaging within the previously defined polygon.

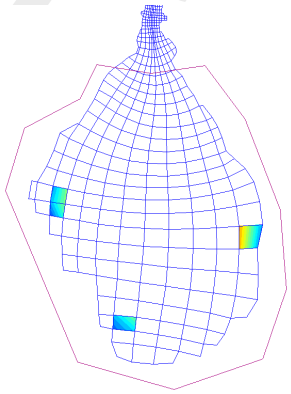

Figure 6.4: *Grid cell averaging result within a pre-defined polygon*

Low sample density

The sparse part is best interpolated by a triangulation method (*Operations* → *Triangular Interpolation*). For the moment hide the samples: *View* → *Samples* → *No Samples*. After a grid cell averaging method and a triangulation most of the depth points did get a value, see Figure 6.5.

Remarks:

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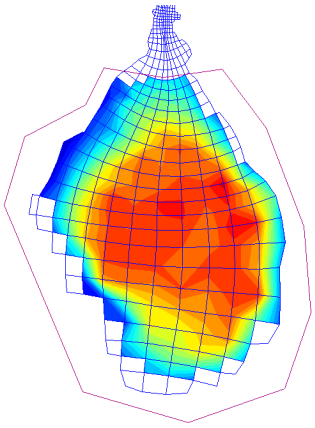

Figure 6.5: *Interpolation results after applying grid cell averaging and triangulation*

- ◇ Only grid points inside the polygon are taken into account for the operation.
- ◇ Only samples inside the polygon are taken into account for the operation.
- ◇ If a grid point has already a depth value assigned, the operation will not overrule this value.
- ◇ If you do not use a polygon to define a limited area, all grid points and samples will be part of the operation.

6.1.5 Points outside area of influence

The result of the previous section is shown in Figure 6.5. Note that grid points that are outside the polygon are excluded from the operation.

As long as not every grid point has a depth value, you are not finished with generating a depth file.

Points that were not interpolated yet

First remove the polygon.

- ◇ On the *Operations* menu, select *Delete* and click *Polygons*, or click on the toolbar.
- ◇ On the *View* menu, select *Depth* and click *Yet to be Found* to see which grid points still have to be assigned a depth value.
- ◇ Edit a new polygon as shown in Figure 6.6.

- ◇ On the *Operations* menu, select *Internal Diffusion* to fill in these missing points within the polygon area. After selecting *View* → *Depth* → *Continuous Shade* from the menubar you obtain Figure 6.7.

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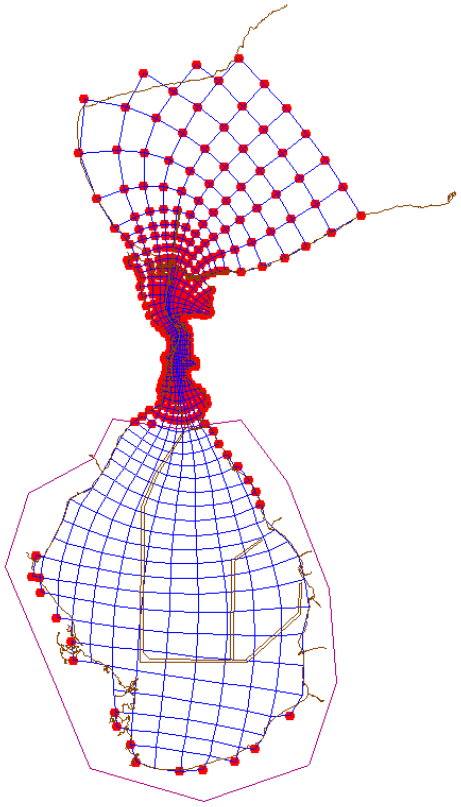

Figure 6.6: *Display of Points Yet to be Found*

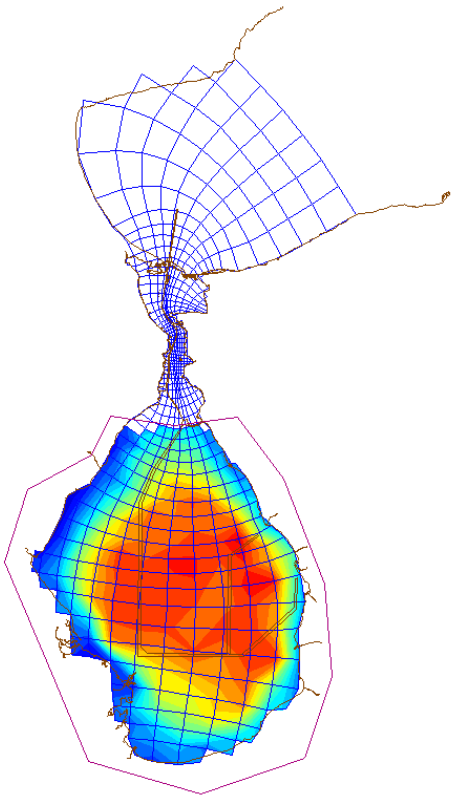

Figure 6.7: *Continuous shade display, all grid points inside the polygon have a depth value*

6.2 Save depth

To save the depth values at the grid points

◇ On the *File* menu, select *Export* and click *Depth*.

The file window **Save Depth** opens, see Figure 6.8.

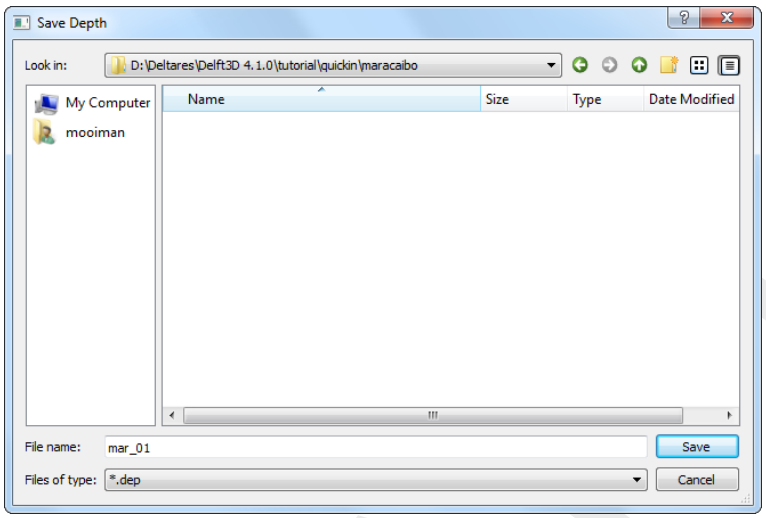

***Figure 6.8: Save Depth** window to save the depth files*

◇ Enter <mar_01> and click *Save* to save the depth file.

6.3 Dredge and dump areas

Start QUICKIN in the <tutorial\quickin\dredge_and_dump> directory.

◇ On the *File* menu, select *Attribute Files* and click *Open Land Boundary...*.
◇ Select and open file <manukau.ldb> that contains an outline of the land boundary.

You can fill the land boundary polygon, first set the colour by selecting the menu option *Settings* → *Colours* and set the appropriate colours (ex. green) for *Land Boundary*, *Land Boundary Filled* and than select menu item *View* → *Land Boundary* → *Filled*.

Now we will define some dredge and dump areas with polygons.

◇ On the *Edit* menu, click *Dredge and Dump Areas* and *New Area*

Define the polygons like in Figure 6.9, finish a polygon by clicking the right mouse button.

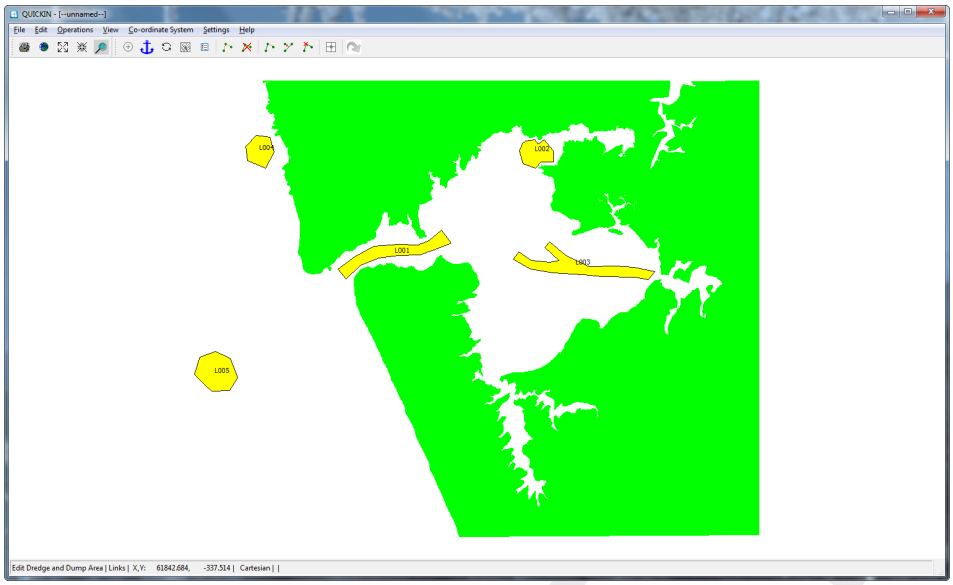

Figure 6.9: *Location of dredge and dump areas*

Renaming the default polygon names can be done by editing the properties of an area. Select *Edit* → *Dredge and Dump Areas* → *Edit Properties*, click in an area and change the polygon names as listed below.

- ◇ Rename the polygon in the north-east of the harbour “dredge 1”
- ◇ Rename the polygon in the east of the harbour “dredge 2”
- ◇ Rename the polygon in the entrance of the harbour “dredge 3”
- ◇ Rename the northerly polygon at sea “dump 1”
- ◇ Rename the southerly polygon at sea “dump 2”

You will see that the the polygons are filled in and the names are shown at the mass-centre of the polygon, see Figure 6.10.

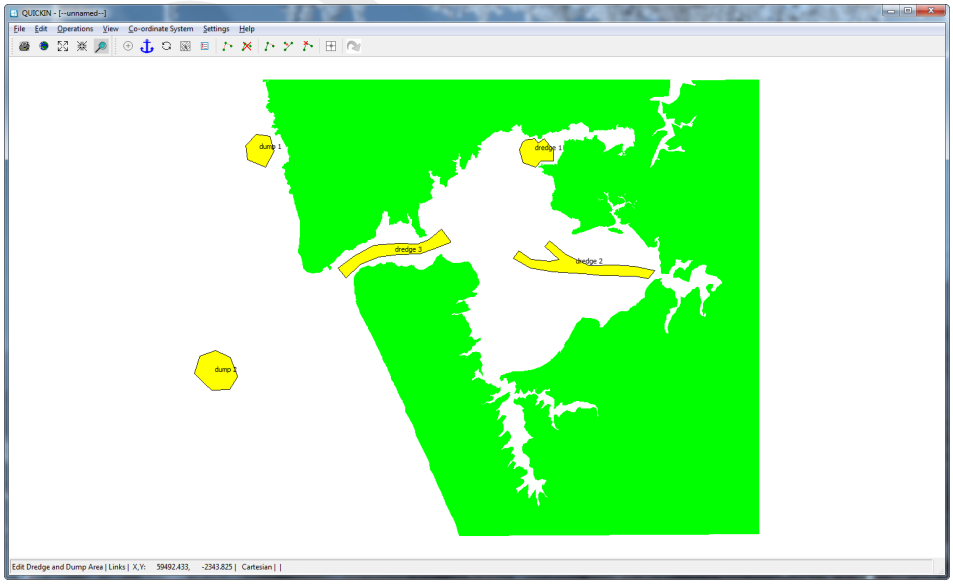

Figure 6.10: *Edit Dredge and Dump, with polygon names*

- ◇ When finished point to *Files* → *Delft3D-FLOW Attributes*→ *Save Dredge and Dump Areas*

to save dredge and dump areas to the files <∗.pol> and <∗.dad>.

To define the links that connect dredge to dump areas, first press *Edit* → *Dredge and Dump Areas* → *New Link*. Next, click inside a dredge polygon, followed by a click inside a dump polygon.

- ◇ Connect ‘dredge 1’ to ‘dump 1’.
- ◇ Connect ‘dredge 2’ to ‘dump 1’.
- ◇ Connect ‘dredge 3’ to ‘dump 2’.

The result is shown in Figure 6.11.

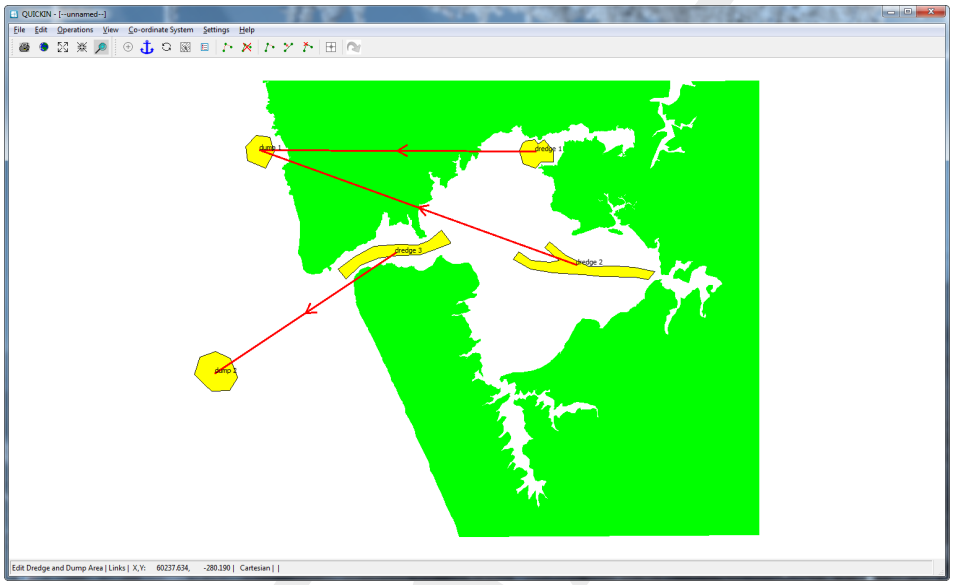

Figure 6.11: *Dredge and Dump areas with their links*

If you want to delete a link, first select *Edit* → *Dredge and Dump Areas* → *Delete Link*, and next click the dredge depth field of the link to be deleted.

To edit the dredging properties, select the *Edit* → *Dredge and Dump Areas* → *Edit Properties*. Now you can edit the properties of the dredge and dump area by clicking them and typing the requested fields, see Figure 6.12.

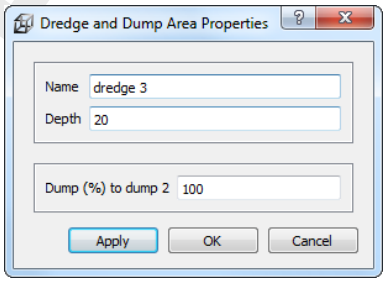

Figure 6.12: *Change the dredge and dump area properties*

- ◇ Set the dredge depth in the areas ‘dredge 1’ and ‘dredge 2’ to “10.0 m”, and in ‘dredge 3’ to “20.0 m”, see Figure 6.12.
- ◇ On the *File* menu, point to *Delft3D-FLOW Attributes* and click *Save Dredge and Dump Ar-*

eas, and save the dredge and dump characteristics to the files <option_1_characteristics.pol> and <option_1_characteristics.dad>.

If you already have saved the polygons, ignore the save question. If not, save the polygons.

◇ Exit QUICKIN.

6.4 Flooding animation

This functionality only applies for users of Delft1D2D.

Start QUICKIN in directory <...\tutorial\quickin\flooding_animation>.

◇ On the *File* menu, select *Import* and click *Open Grid and Depth (Arc)* and open <atiel.aht>.
◇ On the *File* menu, select *Import* and click *Grid (Incremental)* and open the incremental file <tlt.inc>.
◇ On the *Settings* menu, click *Colour Map for Parameters*. Join the *Depth* parameter to the *bathymetry (inverse)* colour map by pressing button *Apply* and join the *Flooding* parameter to the *jet* colour map by pressing button *OK* , see Figure 6.13.

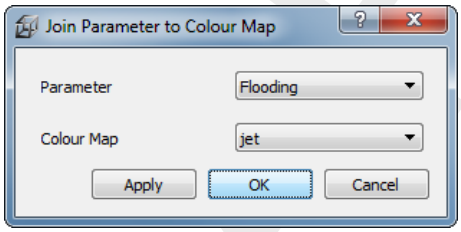

Figure 6.13: *Join parameter* Flooding *to colour map* jet

◇ Press the spacebar to start/stop the animation. See Figure 6.14 for a certain time in the flooding animation.

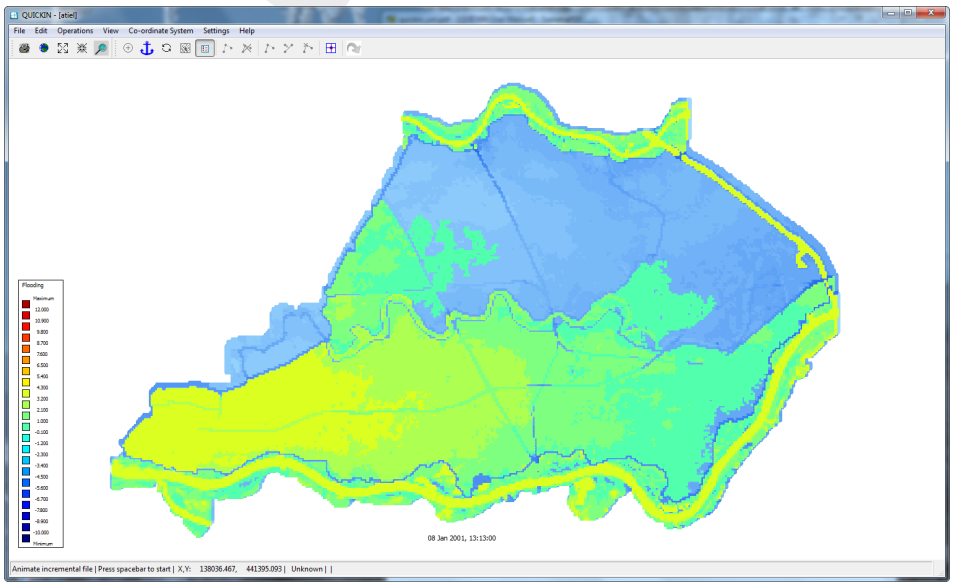

Figure 6.14: *Example of a flooding image*

◇ Exit QUICKIN.

6.5 QUICKIN in the ArcMap environment

In this case you should be familiar with using co-ordinate systems in ArcMap.

ArcMap layers (e.g. shape files, SDE layers) most times have also information about the co-ordinate system (spatial reference). If not available, ArcMap marks this as unknown. On the other hand, if it is known to you, spatial reference can be added to these layers by the program ArcCatalog.

If the layers in ArcMap have a projected co-ordinate system or probably an unknown co-ordinate system, then you can use *Cartesian* in QUICKIN. It is your responsibility the co-ordinates have the unit metres. You can see the used (projected) co-ordinate system of the layers and of the data frame via the properties of the data frame. For QUICKIN the co-ordinate system of the data frame is leading. As you know, ArcMap has possibilities to set the co-ordinate system of the data frame, while layers have different co-ordinate systems.

If you want to use spherical co-ordinates in QUICKIN while using ArcMap, the co-ordinate system of the data frame must be WGS84 (in ArcMap it has the name CGS_WGS_1984). This will be the case when all layers have this co-ordinate system.

If you are familiar with ArcMap you can have one or more layers with different co-ordinate systems and select (import) the WGS84 system for the data frame. Figure 6.15 shows the properties window of de data frame, <custom> give the co-ordinate system of the data frame.

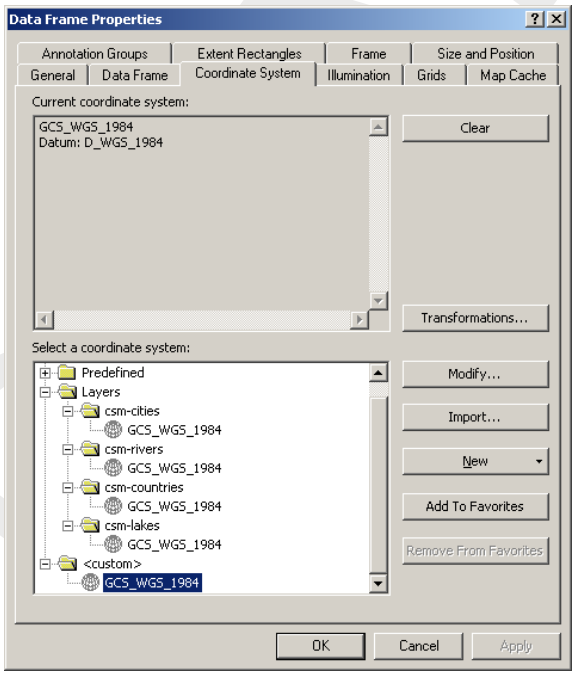

Figure 6.15: *ARC-GIS data frame properties form*

You start loading layers or an <∗.mxd> file in ArcMap. The co-ordinate system of the data frame must be as described above. You will see that ArcMap displays the values of longitude and latitude as plane co-ordinates in degrees.

Then you can start using the commands and functions of QUICKIN. The program has a menu item to change into projected co-ordinates. When using this command, the layers in ArcMap are displayed as projected and also the grid, polygons, samples of the program.

When using the menu item *View* → *Spherical Co-ordinates* → *Plane Co-ordinates*, both the layers in ArcMap and the objects of QUICKIN are displayed as plane co-ordinates.

Centring the screen in stereographic mode

In the standalone version of QUICKIN, the visualisation using the stereographic projection method always uses the centre of the screen as the point where the screen touches the sphere. This is more difficult to realise when working within the GIS environment because screen handling now is governed by the GIS system. Therefore a special function has been implemented to perform this task of centring the computer screen. This function can be invoked by clicking the menu item *Operations* → *Change Centre of Projection*, see Figure 6.16. When using this command the centre of the projection is set to the centre of the screen. This action needs recalculation of the projection and a new screen refresh. By using this command you are aware of changing the screen. When using zoom in, zoom out, pan, the centre of the projection does not change. So there is more performance and a smooth screen-refresh in this case.

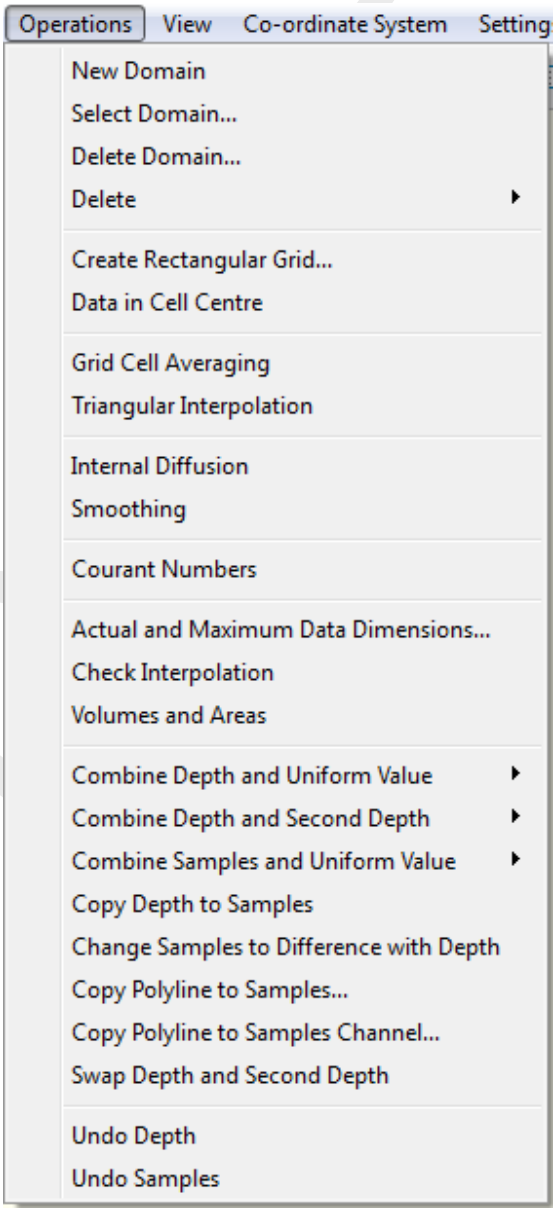

Figure 6.16: *Options on the* Operations *menu*

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References

Delft1D2D, 2002. *Delft1D2D User Manual*. Deltares, 0.00 ed.

Delft3D-FLOW, 2013. *Delft3D-FLOW User Manual*. Deltares, 3.14 ed.

GPP, 2013. *Delft3D-GPP User Manual*. Deltares, 2.14 ed.

QUICKPLOT, 2013. *Delft3D-QUICKPLOT User Manual*. Deltares, 2.14 ed.

RGFGRID, 2013. *Delft3D-RGFGRID User Manual*. Deltares, 4.00 ed.

SWAN, 2000. *SWAN Cycle III version 40.11 User Manual (not the short version)*. Delft University of Technology, Delft, The Netherlands, 0.00 ed.

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A Files of QUICKIN

In the following sections we describe the attribute files used in QUICKIN.

For each file which can handled by QUICKIN we give the following information:

- ◇ File contents.
- ◇ Filetype (free formatted, fix formatted or unformatted).
- ◇ Filename and extension.
- ◇ Generated by (i. e. how to generate the file).
- ◇ Restrictions on the file contents.
- ◇ Example(s).

Remarks:

- ◇ The access mode of all attribute files is sequential.
- ◇ In the examples the file content is printed in font Courier and comment (not included in the file) between curly brackets font, unless explicitly stated differently.

A.1 Delft3D project file

File contents	Domain input for a model.
Filetype	ASCII
File format	Free formatted.
Filename	<*name*.d3d>
Generated	RGFGRID, QUICKIN, D-Waq DIDO, or manually offline

Record description:

A header block containing general information and then for each domain a detailed description.

Keyword	**Description**
FileInformation	
FileCreatedBy	Version string of the program who generated this file the first time
FileCreationDate	Creation date and time
FileVersion	Version number of <∗.d3d> file
Geometry	
LandBoundaryName	Name of the file with the land boundaries
LandBoundaryFormat	Format of the land boundary file, possible values are: TEKAL, NETCDF or SHAPEFILE. The NetCDF file is according the 'World Vector Shoreline' format
DDBound	
FileDDBound	Name of the file with the domain decomposition boundaries

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For each grid

Keyword	Description
Grid	
Type	Format of the grid file, possible values are: RGF, RGF_NETCDF, DFLOW_FM, TELEMAC
FileName	Name of grid file with the geographical co-ordinates
FlowDepth	Name of the file containing the depth values at the cell corners of the grid
Aggregation	Name of the aggregation file

Restriction:

- ◇ The maximum record length in the file is 132.

Example:

The model friesian_tidal_inlet contains three different subdomains (f01, f02, f03) and the project file has the name <friesian_tidal_inlet.d3d.>

```
[FileInformation]
  FileGeneratedBy  = Deltares, Delft3D-DIDO Version 4.04.00.11836M, Jun 21 2010, 12:09:34
  FileCreationDate = 2010-06-21, 13:35:22
  FileVersion      = 0.03
[DDBound]
  FileDDBound = f34-123.ddb
[Grid]
  Type             = RGF
  FileName         = f01.grd
  Aggregation      = f34_dd-f01.dwq
  Monitoring Areas = f34_dd-f01.dmo
[Grid]
  Type             = RGF
  FileName         = f02.grd
  Aggregation      = f34_dd-f02.dwq
  Monitoring Areas = f34_dd-f02.dmo
[Grid]
  Type             = RGF
  FileName         = f03.grd
  Aggregation      = f34_dd-f03.dwq
  Monitoring Areas = f34_dd-f03.dmo
```

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A.2 Land boundary file

File contents	The co-ordinates of one or more polylines. Each polyline (piecewise linear) is written in a single block of data.
Filetype	ASCII
File format	Free formatted
Filename	<*name*.ldb>
Generated	RGFGRID, QUICKIN, etc

Record description:

Record	Record description
	Preceding description records, starting with an asterisk ($*$), and will be ignored.
1	A non blank character string, starting in column one
2	Two integers representing the numbers of rows and number of columns for this block of data
	Two reals representing the x, y or λ, ϕ-co-ordinate

Example:

```
*
* Polyline L007
*
L007
6  2
            132400.0    549045.0
            132345.0    549030.0
            132165.0    549285.0
            131940.0    549550.0
            131820.0    549670.0
            131585.0    549520.0
*
* Polyline L008
*
L008
4  2
            131595.0    549685.0
            131750.0    549865.0
            131595.0    550025.0
            131415.0    550175.0
*
* Polyline L009
*
L009
6  2
            131595.0    549655.0
            148975.0    564595.0
            150000.0    564935.0
            152105.0    565500.0
            153150.0    566375.0
            154565.0    567735.0
```

Remark:

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◇ In case this file is read as a polygon file then the polylines are closed by QUICKIN to get a polygon.

A.3 Sample file

File contents	The location and value of samples.
Filetype	ASCII
File format	Free formatted
Filename	<*name*.xyz>
Generated	Manually or Offline with QUICKIN or Delta Shell and data from digitised charts or GIS-database.

Record description:

Filetype	Record description
Free formatted	Location and sample value per row Two reals representing the x, y or λ, ϕ-coordinate and one real representing the sample value

Example:

Sample file with 12 sample values with their location (free formatted file).

```
213813.2       603732.1       -4.053000
214686.0       607226.1       -4.522000
214891.7       610751.2       -5.000000
210330.8       601424.1       -2.169000
211798.0       604444.8       -2.499000
212460.0       607475.7       -2.760000
212436.9       610362.5       -2.865000
185535.4       606607.9        1.360000
186353.0       603789.4        1.122000
187959.2       601197.6       0.9050000
190193.0       599101.5       0.7050000
208578.7       602513.7      -0.7990000
```

A.4 Polygon file

File contents	The co-ordinates of one or more polygons. Each polygon is written in a single block of data
Filetype	ASCII
File format	Free formatted
Filename	<*name*.pol>
Generated	RGFGRID, QUICKIN, D-Waq DIDO, etc

Record description:

The file may contain one or more polygons. For every polygon the file should contain a line indicating the name of the polygon, followed by a line indicating the number of points making up the polygon and the number of coordinates, i.e. 2, finally followed by the coordinate data.

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Record	Record description
	Preceding description records, starting with an asterisk ($*$), and will be ignored.
1	A non blank character string, starting in column one
2	Two integers representing the numbers of rows and number of columns for this block of data
	Two reals representing the x, y or λ, ϕ-coordinate

Restriction:

- ◇ The first record and the last record in the block should be the same

Example:

```
*
* Deltares, Delft3D-DIDO Version 3.39.01.4423:4459, Sep 25 2008, 20:10:54
* 2008-09-25, 22:11:08
*
Observation Area 001
       5   2
   1.8768018E+05   6.1708738E+05
   1.8996981E+05   6.1001035E+05
   1.9746314E+05   6.1266423E+05
   1.9480925E+05   6.1838830E+05
   1.8768018E+05   6.1708738E+05
Observation Area 002
       5   2
   2.0011703E+05   6.1818015E+05
   1.9819166E+05   6.1063479E+05
   2.0568498E+05   6.0870942E+05
   2.0797461E+05   6.1599460E+05
   2.0011703E+05   6.1818015E+05
Observation Area 003
       5   2
   1.9340425E+05   6.1396516E+05
   2.0183425E+05   6.1365294E+05
   1.9944054E+05   6.0558720E+05
   1.9522555E+05   6.0595146E+05
   1.9340425E+05   6.1396516E+05
```

A.5 Orthogonal curvilinear grid file

File contents	The co-ordinates of the orthogonal curvilinear grid at the depth points.
Filetype	ASCII
File format	Free formatted
Filename	<*name*.grd>
Generated	RGFGRID

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Record description:

Record	Record description
	Preceding description records, starting with an asterisk ($*$), will be ignored.
1	Record with `Co-ordinate System = Cartesian` or value `Spherical`
2	The number of grid *points* in m- and n-direction (2 integers).
3	Three real values (not used).
4 to K+3	A label and record number, the x-component of the world co-ordinates of all points in m-direction, starting with row 1 to row $nmax$, with as many continuation records as required by $mmax$ and the number of co-ordinates per record. The label and record number are suppressed on the continuation lines. This set of records is repeated for each row until $n = nmax$.
K+4 to 2K+3	A similar set of records for the y-component of the world co-ordinates.

K is the number of records to specify for all grid points a set of x- or y-co-ordinates.

Restrictions:
- ◇ The grid must be orthogonal.
- ◇ Input items in a record are separated by one or more blanks.

Example:

```
*
* Deltares, Delft3D-RGFGRID  Version 4.16.01.4531, Sep 30 2008, 23:32:27
* File creation date: 2008-10-01, 23:19:22
*
Coordinate System = Cartesian
       9       7
 0 0 0
 Eta=    1   0.0000000000000000E+00   1.0000000000000000E+02   2.000000...
             5.0000000000000000E+02   6.0000000000000000E+02   7.000000...
 Eta=    2   0.0000000000000000E+00   1.0000000000000000E+02   2.000000...
             5.0000000000000000E+02   6.0000000000000000E+02   7.000000...
 Eta=    3   0.0000000000000000E+00   1.0000000000000000E+02   2.000000...
             5.0000000000000000E+02   6.0000000000000000E+02   7.000000...
 Eta=    4   0.0000000000000000E+00   1.0000000000000000E+02   2.000000...
             5.0000000000000000E+02   6.0000000000000000E+02   7.000000...
 Eta=    5   0.0000000000000000E+00   1.0000000000000000E+02   2.000000...
             5.0000000000000000E+02   6.0000000000000000E+02   7.000000...
 Eta=    6   0.0000000000000000E+00   1.0000000000000000E+02   2.000000...
             5.0000000000000000E+02   6.0000000000000000E+02   7.000000...
 Eta=    7   0.0000000000000000E+00   1.0000000000000000E+02   2.000000...
             5.0000000000000000E+02   6.0000000000000000E+02   7.000000...
 Eta=    1   1.0000000000000000E+02   1.0000000000000000E+02   1.000000...
             1.0000000000000000E+02   1.0000000000000000E+02   1.000000...
 Eta=    2   2.0000000000000000E+02   2.0000000000000000E+02   2.000000...
             2.0000000000000000E+02   2.0000000000000000E+02   2.000000...
 Eta=    3   3.0000000000000000E+02   3.0000000000000000E+02   3.000000...
```

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```
            3.00000000000000000E+02   3.00000000000000000E+02   3.000000...
Eta=    4   4.00000000000000000E+02   4.00000000000000000E+02   4.000000...
            4.00000000000000000E+02   4.00000000000000000E+02   4.000000...
Eta=    5   5.00000000000000000E+02   5.00000000000000000E+02   5.000000...
            5.00000000000000000E+02   5.00000000000000000E+02   5.000000...
Eta=    6   6.00000000000000000E+02   6.00000000000000000E+02   6.000000...
            6.00000000000000000E+02   6.00000000000000000E+02   6.000000...
Eta=    7   7.00000000000000000E+02   7.00000000000000000E+02   7.000000...
            7.00000000000000000E+02   7.00000000000000000E+02   7.000000...
```

A.6 Bathymetry file

File contents	The bathymetry in the model area, represented by depth values (in metres) for all grid points.
Filetype	ASCII
File format	Free formatted or unformatted
Filename	<*name*.dep>
Generated	FLOW-GUI (only for uniform depth values). Offline with QUICKIN and data from digitised charts or GIS-database.

Record description:

Filetype	Record description
Free formatted	Depth values per row, starting at N = 1 to N = Nmax, separated by one or more blanks. The number of continuation lines is determined by the number of grid points per row (Mmax) and the maximum record size of 132.
Unformatted	Mmax depth values per row for N = 1 to N = Nmax.

Restrictions:

- ◇ The file contains one M and N line more than the grid dimension.
- ◇ The maximum record length in the free formatted file is 132.
- ◇ Depth values from the file will not be checked against their domain.
- ◇ The input items are separated by one or more blanks (free formatted file only).
- ◇ The default missing value is: -999.0

Example:

File containing $16 * 8$ data values for a model area with $15 * 7$ grid points (free formatted file).

```
  1.0    2.0    3.0    4.0   -5.0   -5.0   -5.0    8.0    9.0   10.0   11.0
 12.0   13.0   14.0   -5.0 -999.0
  3.0    4.0    5.0    6.0    7.0   -6.0   -6.0   10.0   11.0   12.0   13.0
 14.0   15.0   16.0   17.0 -999.0
  5.0    6.0    7.0    8.0    9.0   10.0   -7.0   12.0   13.0   14.0   15.0
 16.0   17.0   18.0   19.0 -999.0
  7.0    8.0    9.0   10.0   11.0   12.0   13.0   14.0   15.0   16.0   17.0
 18.0   19.0   -7.0   19.0 -999.0
  9.0   10.0   11.0   12.0   13.0   14.0   15.0   16.0   17.0   18.0   19.0
 20.0   19.0   18.0   17.0 -999.0
 -7.0   12.0   13.0   14.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0
 18.0   17.0   16.0   15.0 -999.0
 -8.0   -8.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0   18.0   17.0
 16.0   15.0   14.0   13.0 -999.0
-999.0 -999.0 -999.0 -999.0 -999.0 -999.0 -999.0 -999.0 -999.0 -999.0 -999.0
```

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```
-999.0 -999.0 -999.0 -999.0 -999.0
```

A.7 Grid and depth file

File contents	The rectilinear grid and bathymetry at cell centres in the model area, represented by depth values (in metres) for all grid cells.
Filetype	ASCII
File format	Free formatted
Filename	<*name*.asc>
Generated	Extern program

Header description for the Arc-files:

Keywords	Value	Description
`ncols`	*free*	number of columns used for datafield
`nrows`	*free*	number of rows used for datafield
`xllcorner`	*free*	x-co-ordinate of lower left corner of lower left grid cell
`yllcorner`	*free*	y-co-ordinate of lower left corner of lower left grid cell
`xllcenter`	*free*	x-co-ordinate of centre of lower left grid cell
`yllcenter`	*free*	y-co-ordinate of centre of lower left grid cell
`cellsize`	*free*	gridsize in x-direction and y-direction
`nodata_value`	*free*	value used for input that is to be neglected

Record description:

Filetype	Record description
Free formatted	`Ncols` values per row, starting at $N = 1$ to $N = Ncols$, separated by one or more blanks. The number of continuation lines is equal to `nrows`, starting from $N = Nrows$ to $N = 1$.

Examples

Two examples are given, one example defining the lower left co-ordinate of the grid and one defining the lower left corner at the data point. Both examples has a data file containing $16 * 8$ data values. The first example has its first data value located at $(x, y) = (125, 25)$ and grid corner at $(x, y) = (100, 0)$ (see Figure A.1), and the second example has its first data value located at $(x, y) = (100, 0)$ and grid corner at $(x, y) = (75, -25)$ (see Figure A.2)

Example 1:

```
ncols           16
nrows            8
xllcorner      100
yllcorner        0
cellsize        50
nodata_value -9999
   1.0   2.0   3.0   4.0   5.0   6.0   7.0   8.0   9.0  10.0  11.0  12.0  13.0  14.0  15.0   16.0
   2.0   4.0   5.0   6.0   7.0  -6.0  -6.0  10.0  11.0  12.0  13.0  14.0  15.0  16.0  17.0   17.0
   3.0   6.0   7.0   8.0   9.0  10.0 -9999 -9999  13.0  14.0  15.0  16.0  17.0  18.0  19.0   19.0
   4.0   8.0   9.0  10.0  11.0  12.0 -9999 -9999  15.0  16.0  17.0  18.0  19.0 -7.0   19.0   19.0
   5.0  10.0  11.0  12.0  13.0  14.0  15.0  16.0  17.0  18.0  19.0  20.0  19.0  18.0  17.0   17.0
   6.0  12.0  13.0  14.0  15.0  16.0  17.0  18.0  19.0  20.0  19.0  18.0  17.0  16.0  15.0   15.0
```

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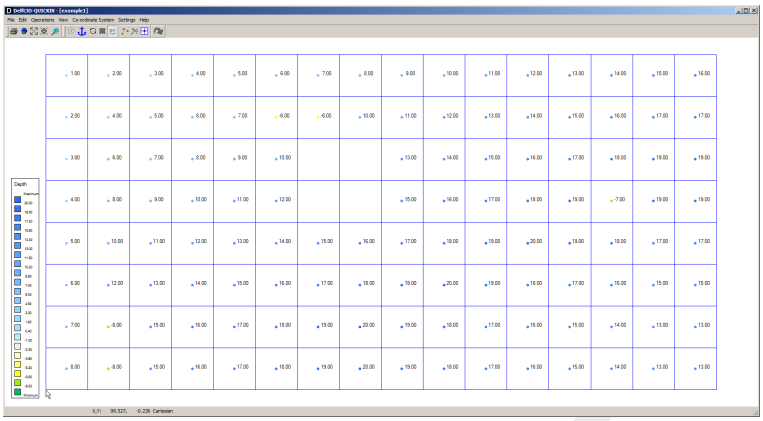

Figure A.1: *Example 1, lower left corner is located at* $(100, 0)$

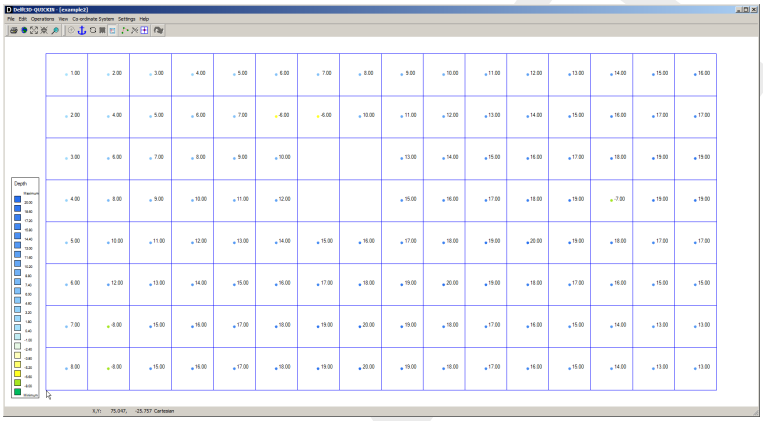

Figure A.2: *Example 2, lower left corner is located at* $(75, -25)$

```
   7.0   -8.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0   18.0   17.0   16.0   15.0   14.0   13.0   13.0
   8.0   -8.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0   18.0   17.0   16.0   15.0   14.0   13.0   13.0
```

Example 2:

```
ncols          16
nrows          8
xllcenter      100
yllcenter      0
cellsize       50
nodata_value -9999
   1.0    2.0    3.0    4.0    5.0    6.0    7.0    8.0    9.0   10.0   11.0   12.0   13.0   14.0   15.0   16.0
   2.0    4.0    5.0    6.0    7.0   -6.0   -6.0   10.0   11.0   12.0   13.0   14.0   15.0   16.0   17.0   17.0
   3.0    6.0    7.0    8.0    9.0   10.0 -9999  -9999   13.0   14.0   15.0   16.0   17.0   18.0   19.0   19.0
   4.0    8.0    9.0   10.0   11.0   12.0 -9999  -9999   15.0   16.0   17.0   18.0   19.0  -7.0    19.0   19.0
   5.0   10.0   11.0   12.0   13.0   14.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0   18.0   17.0   17.0
   6.0   12.0   13.0   14.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0   18.0   17.0   16.0   15.0   15.0
   7.0   -8.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0   18.0   17.0   16.0   15.0   14.0   13.0   13.0
   8.0   -8.0   15.0   16.0   17.0   18.0   19.0   20.0   19.0   18.0   17.0   16.0   15.0   14.0   13.0   13.0
```

A.8 Open boundary file

File contents	The location and description of open boundaries.
Filetype	ASCII
File format	Fix formatted for text variables; free formatted for real and integer values.

Filename <*name*.bnd>
Generated FLOW-GUI

Record description:

Record	Record description
each record	Name of the open boundary section (20 characters). Type of boundary (1 character). Z water level C current N Neumann Q discharge per grid cell T total discharge for boundary section R Riemann Type of data (1 character). A astronomic H harmonic Q QH tables (only for water level boundaries) T time-series Grid indices of the begin and end point of the boundary section (4 integers). Reflection coefficient (1 real), not for Neumann or Riemann. Vertical profile (three strings); *only for 3D simulations and velocity type boundaries (C, Q, T and R).* Uniform Logarithmic 3D profile Two labels (each 12 characters, no blanks in the label name) referencing to the blocks in the amplitude and phase file <∗.bca>; *only if the type of data is A*.

Restrictions:

- ◇ Maximum record length in the free formatted file is 132.
- ◇ The boundary section name must start at position one in a record.
- ◇ The value of the reflection coefficient will not be checked on its domain.
- ◇ All input items in a record must be separated by one or more blanks.
- ◇ Astronomic and harmonic forced boundaries must be specified before QH-relation forced boundaries, which in turn should be specified before time-series forced boundaries.
- ◇ Astronomic and harmonic forced boundaries cannot be combined.

Example:

Two boundary sections with data type A(stronomic) and one with type T(ime series).

```
Paradise Bay 1       Q A   1   1    1   5 0.0 Uniform      Paradise_1A  Paradisee_1B
Paradise Bay 2       C A  16   3   16   6 0.0 Logarithmic  Paradise_2A  Paradisee_2B
Sea Entrance         Z T   4   8   14   8 0.0
```

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Remarks:

- ◇ A label may not contain blanks between non-blank characters.
- ◇ For the labels 12 characters are read. Be sure the second label starts at least 13 positions after the start of the first.

A.9 Dry points file

File contents	Index location of (permanently) dry points.
Filetype	ASCII
File format	Free formatted
Filename	<*name*.dry>
Generated	QUICKIN or FLOW-GUI

Record description:

Record	Record description
each record	The grid indices of the begin and end point of a dry section (4 integers).

Restrictions:

- ◇ The angle of a line of dry points and the horizontal numerical grid axis can be an integer multiple of 45 degrees.
- ◇ Dry points may not be defined along the model boundaries (which by default lie along the lines M = 1, N = 1, M = Mmax or N = Nmax). Therefore, the indices of these points must lie between M = 2 and Mmax-1 and N = 2 and Nmax-1, respectively.
- ◇ The input items are separated by one or more blanks.
- ◇ The most lower-left dry point has indices (2, 2).

Example:

Five sets of dry points in a model area of $19 * 8$ grid points, see Figure A.3.

```
 5   3   5   6
 8   4  10   6
13   3  14   3
13   4  14   4
14   6  14   6
```

A.10 Thin dams file

File contents	Location and type of thin dams.
Filetype	ASCII
File format	Free formatted
Filename	<*name*.thd>
Generated	QUICKIN or FLOW-GUI

Record description:

Record	Record description
each record	The grid indices of the begin and end point of a line of thin dams (4 integers). A character indicating the type of thin dams (U or V).

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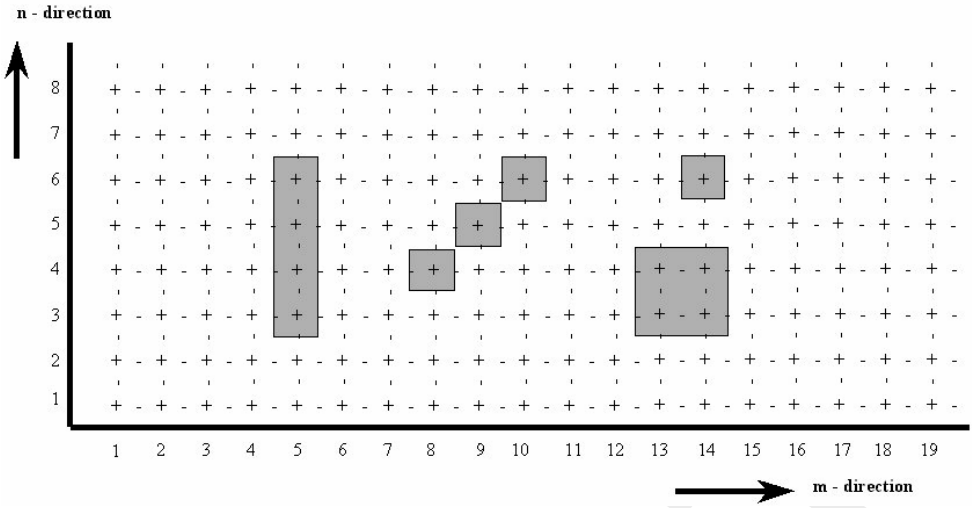

Figure A.3: *Dry points in model area*

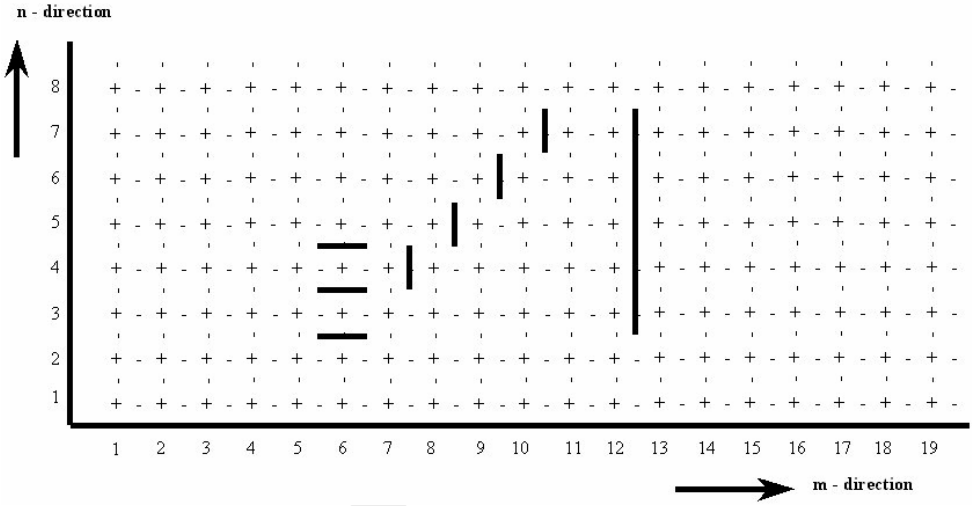

Figure A.4: *Example of thin dams in a model area*

Restrictions:

- ◇ The angle of the line segment and the horizontal numerical grid axis may be an integer multiple of 45 degrees.
- ◇ Thin dams can not be defined along the model boundaries (which by default lie along the lines M = 1, N = 1, M = Mmax or N = Nmax). Therefore, the indices of thin dams must lie between M = 2 and Mmax-1 and N = 2 and Nmax-1 respectively.
- ◇ Input items are separated by one or more blanks.
- ◇ The direction of the dam is perpendicular to the velocity direction over which the dams are superimposed!

Example:

Three (sets of) thin dams in model area of $19 * 8$ grid points, see Figure A.4.

```
 6   2   6   4 V
 7   4  10   7 U
12   3  12   7 U
```

A.11 Observation points file

File contents	Description of observation points characterised by their name and grid indices.
Filetype	ASCII
File format	Fix formatted for text variables, free formatted for integer values.
Filename	<*name*.obs>
Generated	FLOW-GUI or manually offline

Record description:

Record	Record description
each record	Name of observation point (20 characters), Location of the observation point in grid indices (2 integers).

Restrictions:

- ◇ One record per observation point.
- ◇ The name of the observation point must start in position one.
- ◇ The maximum record length is 132.
- ◇ Input items in a record must be separated by one or more blanks.

Example:

File containing 5 observation points:

```
Paradise Bay 1        10  11
Paradise Bay 2        11  11
Sea Entrance           4   8
Port Arthur           18  85
Deep Channel          22  44
```

A.12 Annotation file

File contents	File with x and y co-ordinates, string and rgb-colour.
Filetype	ASCII
File format	Free formatted.
Filename	<*name*.txt>
Generated	manually offline

Record description:

Record	Record Description
1	Records starting with a $*$ are comment lines Character string to define the datablock (nonblank)
2	Number of rows
3–N	real, real, string, integer: geographical co-ordinates (2 reals), text between quotes which need to be plotted (string) and rgb-colour (integer; $= 256 * 256 * r + 256 * g + b$)

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Restriction:
- ◇ The maximum record length in the file is 132.

Example:

```
*
BL01
8 4
10.0  10.0   'string-01'  6553625
10.0  20.0   'string-02'  9830425
20.0  10.0   'string-03' 13120000
20.0  20.0   'string-04' 16724480
30.0  10.0   'string-05'    38425
30.0  20.0   'string-06'    65305
40.0  10.0   'string-07'      255
40.0  20.0   'string-08'        0
```

A.13 DD Boundary file

File contents	Domain decomposition boundaries connecting two grids for the prescribed indices.
Filetype	ASCII
File format	Fix formatted.
Filename	<*name*.ddb>
Generated	RGFGRID, or manually offline

Record description:

Record	Record Description
N	Name of the first grid, followed by four integers indicating the gridline on which the boundary lies, followed by the name of the second grid and four integers indicating the gridline on which the boundary lies.

Restrictions:
- ◇ No space allowed in grid filename.
- ◇ The maximum record length in the file is 132.

Example:

In the following example 4 sub-domains exist. Domain d01_ns is coupled to oa1_ns, ob1_ns and oc1_ns. Furthermore oa1_ns is coupled to ob1_ns, and ob1_ns to oc1_ns.

```
d01_ns.grd     5   16    5    1  oa1_ns.grd    28   35   28   20
d01_ns.grd   245    1    5    1  ob1_ns.grd    17   21    1   21
d01_ns.grd   245   52  245    1  oc1_ns.grd     1   44    1   27
ob1_ns.grd     1    4    1   21  oa1_ns.grd    28    3   28   20
ob1_ns.grd    17    4   17   21  oc1_ns.grd     1   10    1   27
```

A.14 Colour scheme file

File contents	The colour scheme
Filetype	ASCII
File format	Free formatted
Filename	<*name*.clr> or <*name*.clrmap>
Generated	manually

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Record description:

Record	Record description
1	COLORMAP
2	NAME=name
3	SPACE=RGB, RGB is the only allowed space for this program
4 – N	one real and three integers.

The first column represent the relative distribution of the defined colours in column 2–4 (representing the RGB values).

Example:

```
COLORMAP
NAME=copper
SPACE=RGB
0.0000   0   0   0
0.8000 255 159 101
1.0000 255 199 127
```

A.15 Settings file

File contents	Settings of the program
Filetype	ASCII
File format	Fix formatted
Filename	<*name*.ini>
Generated	By the program

Record description:

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Record	Record description
FileInformation	
FileCreatedBy FileCreationDate FileVersion	QUICKIN version number creation date and time version number of $<*$.ini$>$ file
QNParameter	
name	integer value
TextSettings	
name	value (integer or real)
QNsettings	
name	value (integer or real)
Colours	
name	RGB value (3 integers) line width dots sizes

Example:

```
[FileInformation]
  FileGeneratedBy  = Deltares, Delft3D-QUICKIN Version 4.20.00.11763:11790M, Jun 16 2010, 14:26:47
  FileCreationDate = 2010-06-16, 14:27:41
  FileVersion      = 0.02
[RGFSettings]
  MGridCells                =  50
  NGridCells                =  50
  DeltaX                    =   1.0000000000000000E+02
  DeltaY                    =   1.0000000000000000E+02
  OriginX                   =   0.0000000000000000E+00
  OriginY                   =   1.0000000000000000E+02
  RotationLeft              =   0.0000000000000000E+00
  RadiusCurvatureM          =   0.0000000000000000E+00
  MFraction                 =   1.0000000000000000E+00
  MaximumSizeUniformMSize   =   1.0000000000000000E+00
  NFraction                 =   1.0000000000000000E+00
  MaximumSizeUniformNSize   =   1.0000000000000000E+00
[QNParameter]
  AutoscaleLegend           =   1
  XCoorLegend               =  16
  YCoorLegend               =  20
[TextSettings]
  Line1                     =
  Line2                     =
  Line3                     =
  Fontsize                  =   3.0000000000000000E+00
  Xposition                 =   0.0000000000000000E+00
  Yposition                 =   0.0000000000000000E+00
  FontsizeTimeDate          =   3.0000000000000000E+00
  XposTimeDate              =   5.0000000000000000E+01
  YposTimeDate              =   5.0000000000000000E+00
```

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```
[QNSettings]
  StayOnStartupDirectory    =   0
  NrDiffusionStep           = 100
  NrSmoothingSteps          =  10
  SmoothingFactor           =   5.00000000000000000E-01
  DtCFLNumber               =   6.00000000000000000E+01
  ReferenceLevelZref        =   0.00000000000000000E+00
  SearchCellSizeAveraging   =   1.10000000000000009E+00
  MinAveragingPoints        =   4
  DtIncrementalImages       =   1.00000000000000000E+00
  ParameterPlotIncremental  =   1
  NrSamplePerSegment        =   9
  FixedDistanceSamplePoints =   0.00000000000000000E+00
  PositionSamples           =   0
  DisplaySlopeCriterion     =   0
  DisplayAsNumber           =   1
  DisplayCriterionCheck     =   0
  ValueSlopeCheckCriterion  =   1.00000000000000006E-01
  WavePeriod                =   6.00000000000000000E+00
  DepthOffset               =   0.00000000000000000E+00
  ChannelWidthBegin         =   1.00000000000000000E+02
  ChannelDepthBegin         =   1.00000000000000000E+01
  ChannelWidthEnd           =   1.00000000000000000E+02
  ChannelDepthEnd           =   1.00000000000000000E+01
  NrPointsAcrossChannel     =   5
  MinDepth                  =   1.00000000000000000E+01
  RemoveAddSamples          =   0
[Colours]
  ColourBackground          = 255 255 210
  LegendColourBackground    = 255 255 255
  lineColourText            = 005 005 005
  lineColourLandBoundary    = 132 066 000
  fillColourLandBoundary    = 255 182 108
  lineColourPolygon         = 170 000 127
  fillColourPolygon         = 170 000 127
  lineColourActiveGrid      = 000 000 255
  lineColourActiveCmpBnd    = 005 005 005
  lineColourGrid            = 192 192 192
  lineColourCmpBnd          = 050 050 050
  DryPoints                 = 203 203 000
  ThinDams                  = 203 203 000
  ObservationPoints         = 227 227 000
  DredgeAndDumpArea         = 255 255 000
  DredgeAndDumpLink         = 255 000 000
[Width]
  lineWidthLandBoundary     =   1
  lineWidthPolygon          =   1
  DotSizeSamples            =   7
  lineWidthActiveGrid       =   1
  lineWidthActiveCmpBnd     =   1
  lineWidthGrid             =   1
  lineWidthCmpBnd           =   1
  lineWidthThinDams         =   3
  DredgeAndDump             =   3
[Caches]
  rest                      =   0
  text                      =   0
  polygons                  =   0
  dad                       =   1
  drythdobs                 =   1
  cmpbound                  =   1
  secdepth                  =   2
  actgrid                   =   2
  actdepth                  =   3
  samples                   =   3
  landboundary              =   1
```

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```
inactgrid                 =   4
trisample                 =   5
```

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